FIGURE 1
(Prior Art)

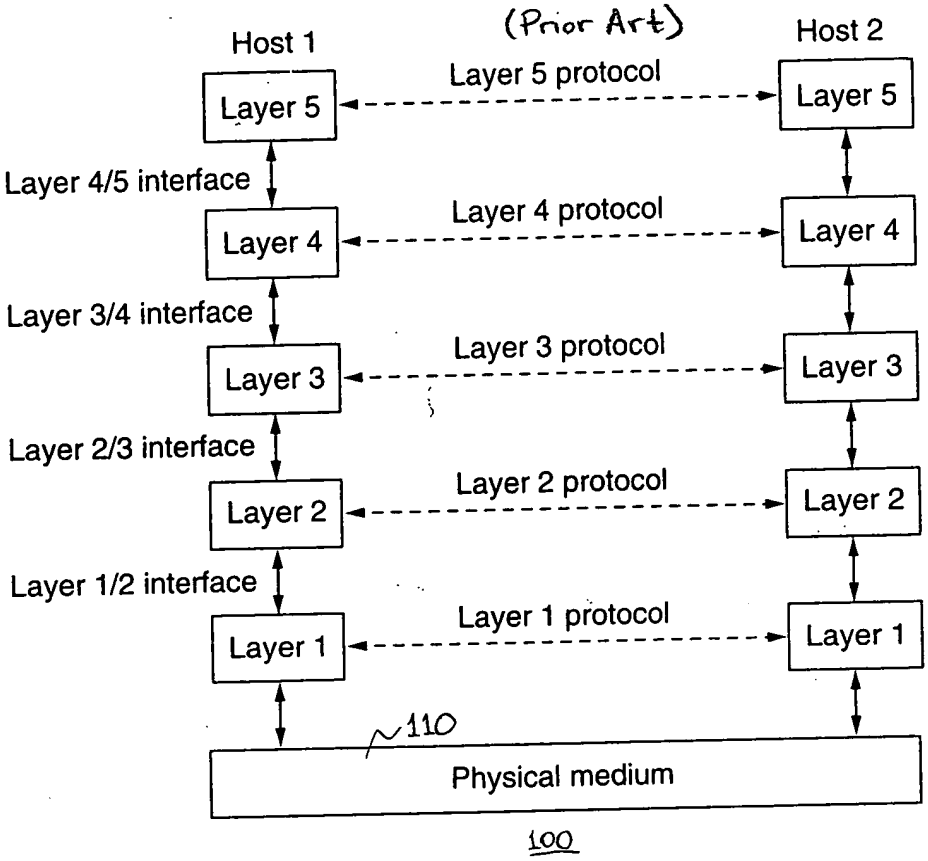
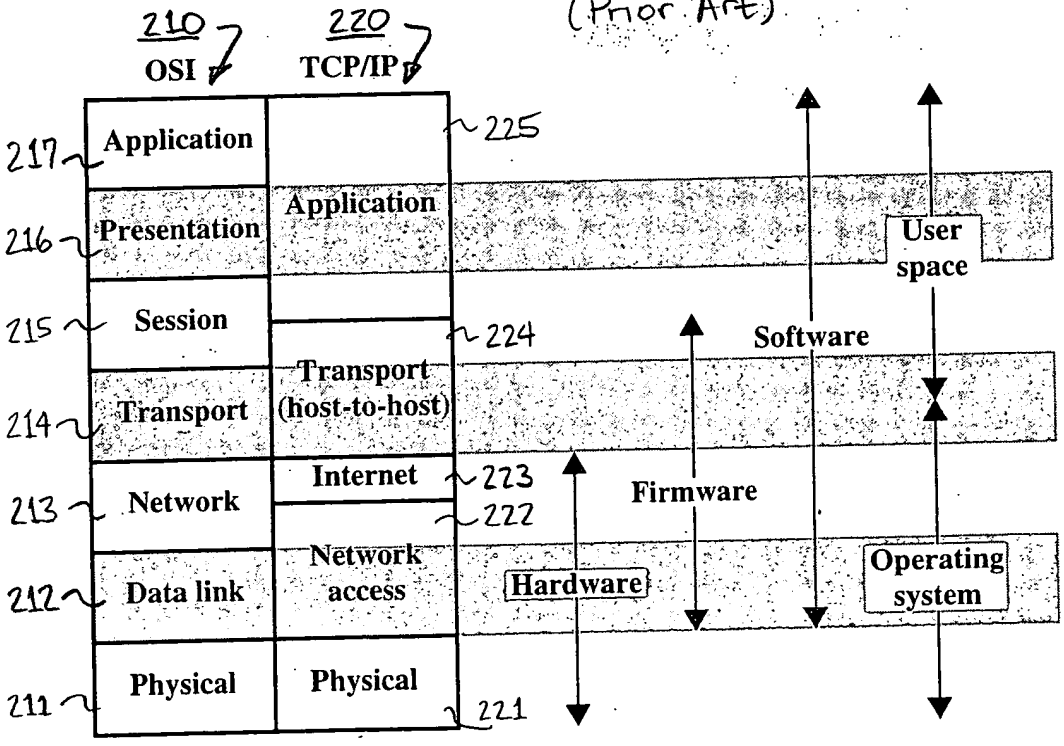
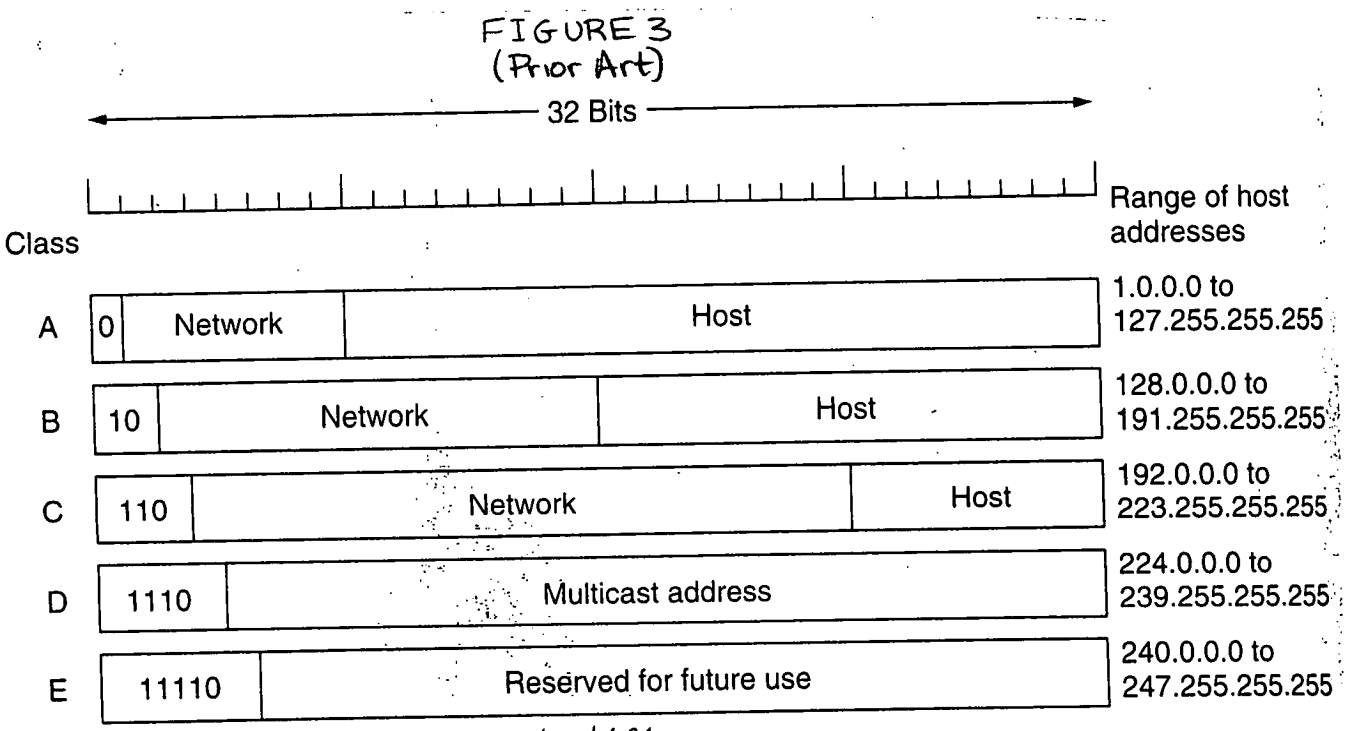


FIGURE 2
(Prior Art)



0078807 05725960

FIGURE 3
(Prior Art)



622/624

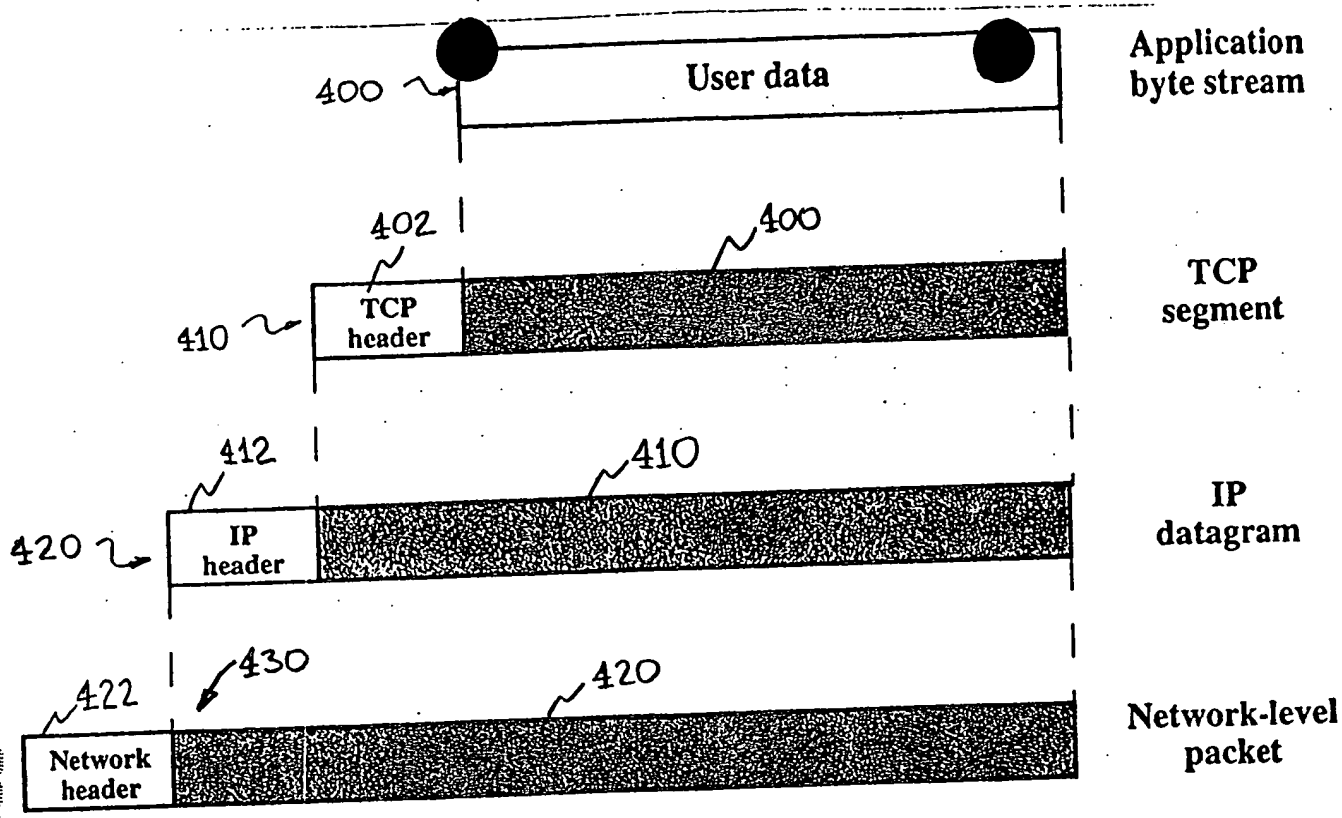


FIGURE 4
(Prior Art)

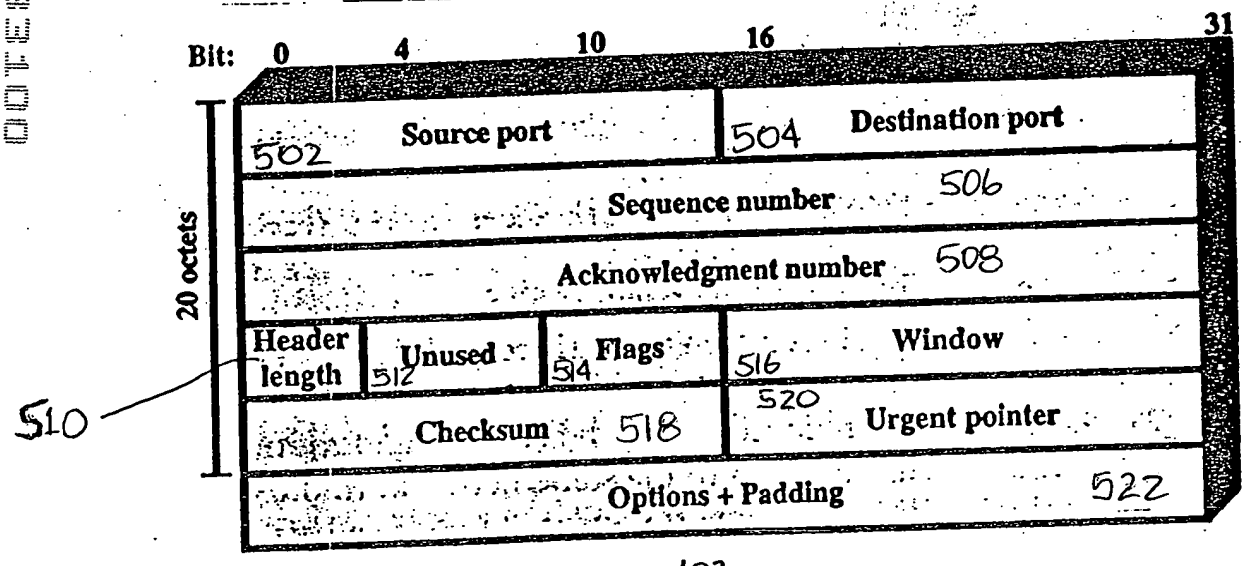


FIGURE 5
(Prior Art)

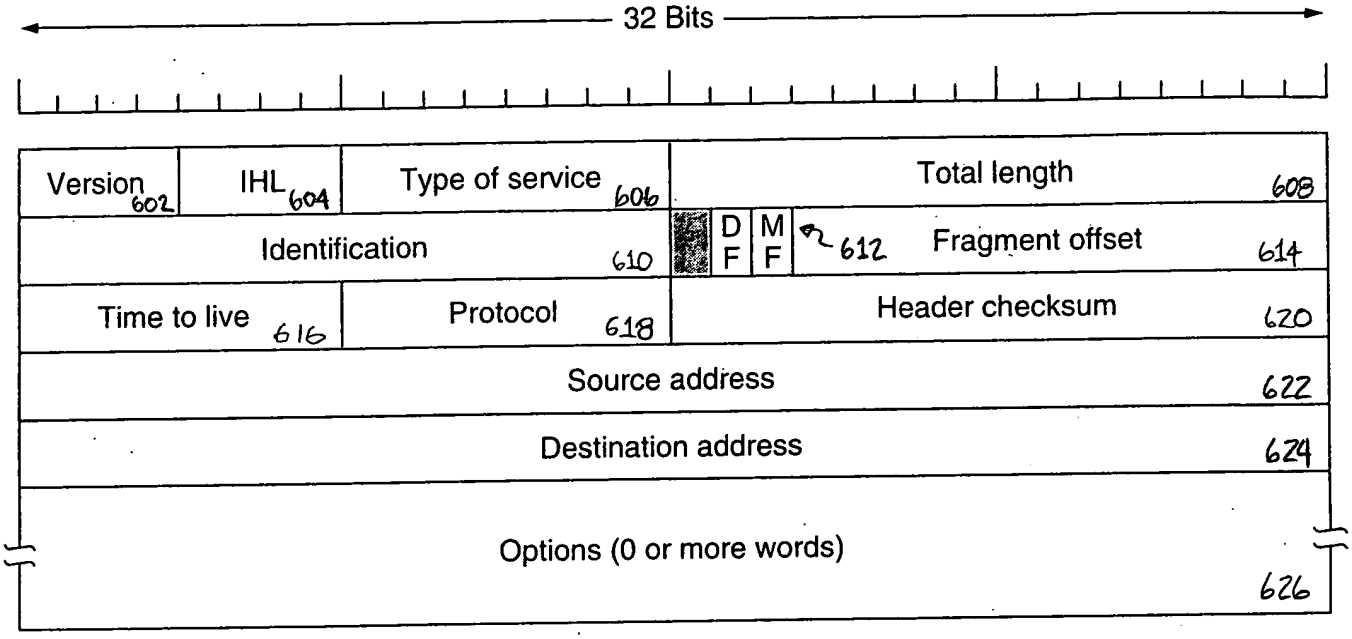


FIGURE 6A

(Prior Art)

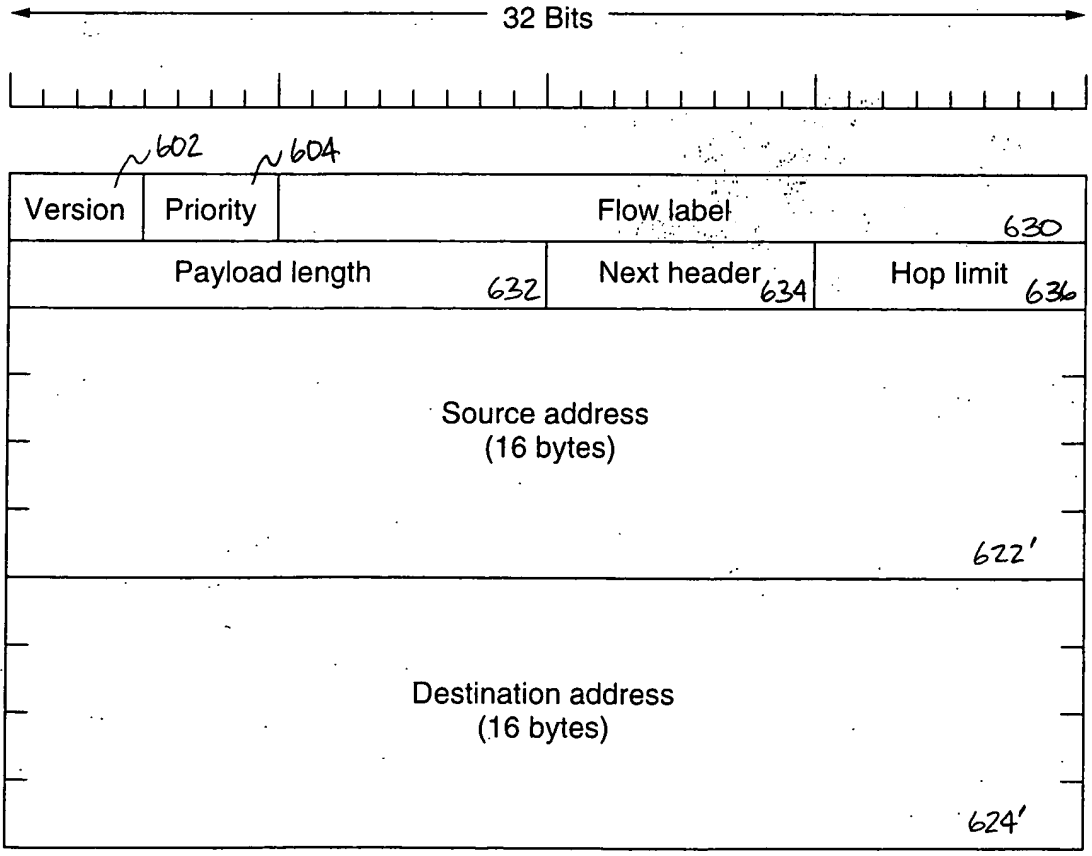


FIGURE 6B

(Prior Art)

D05N5450.080400

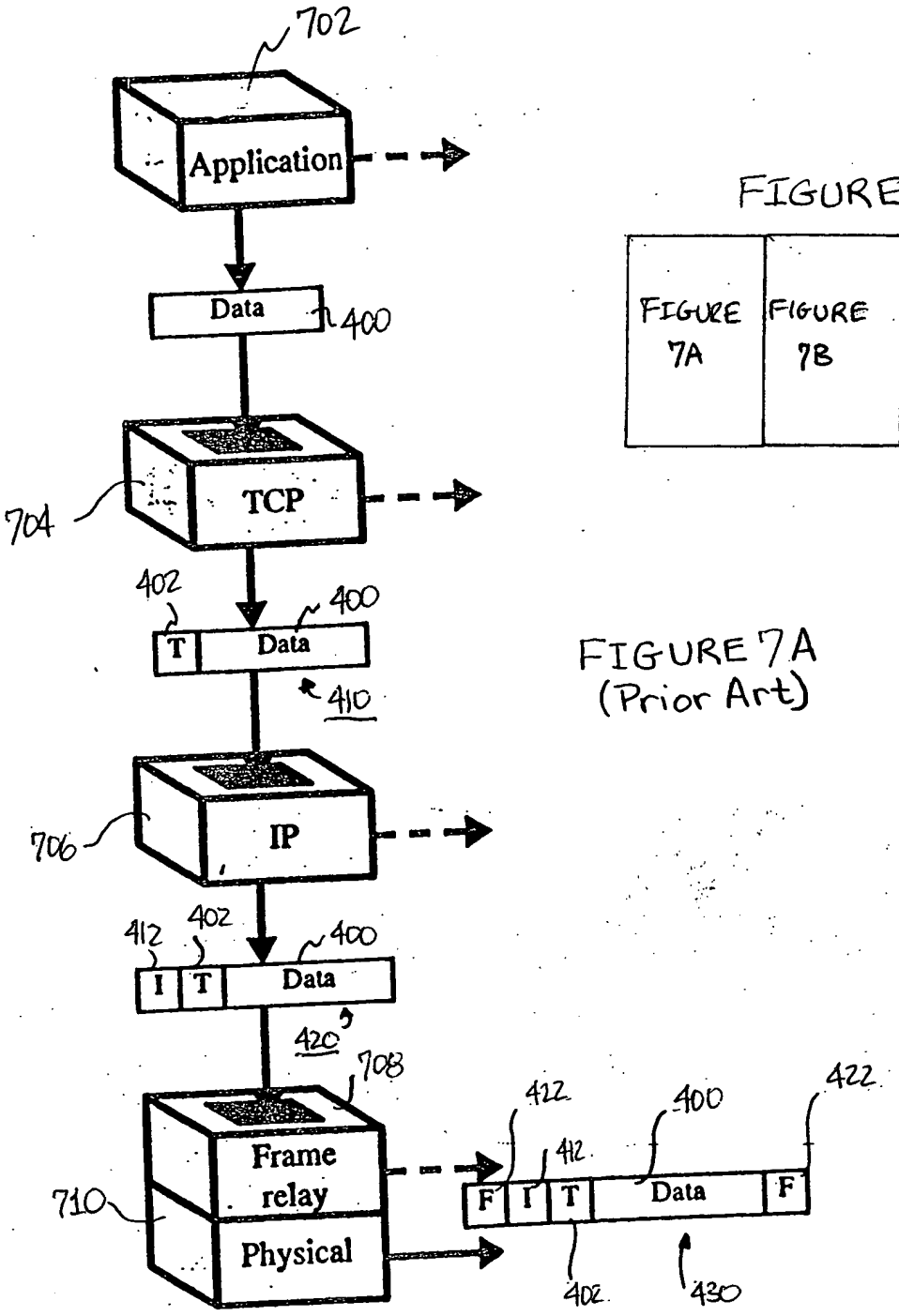


FIGURE 7

FIGURE 7A	FIGURE 7B	FIGURE 7C

FIGURE 7A
(Prior Art)

Docket: 95-2-050

DOCKET NO. 95-2050-08-CIP

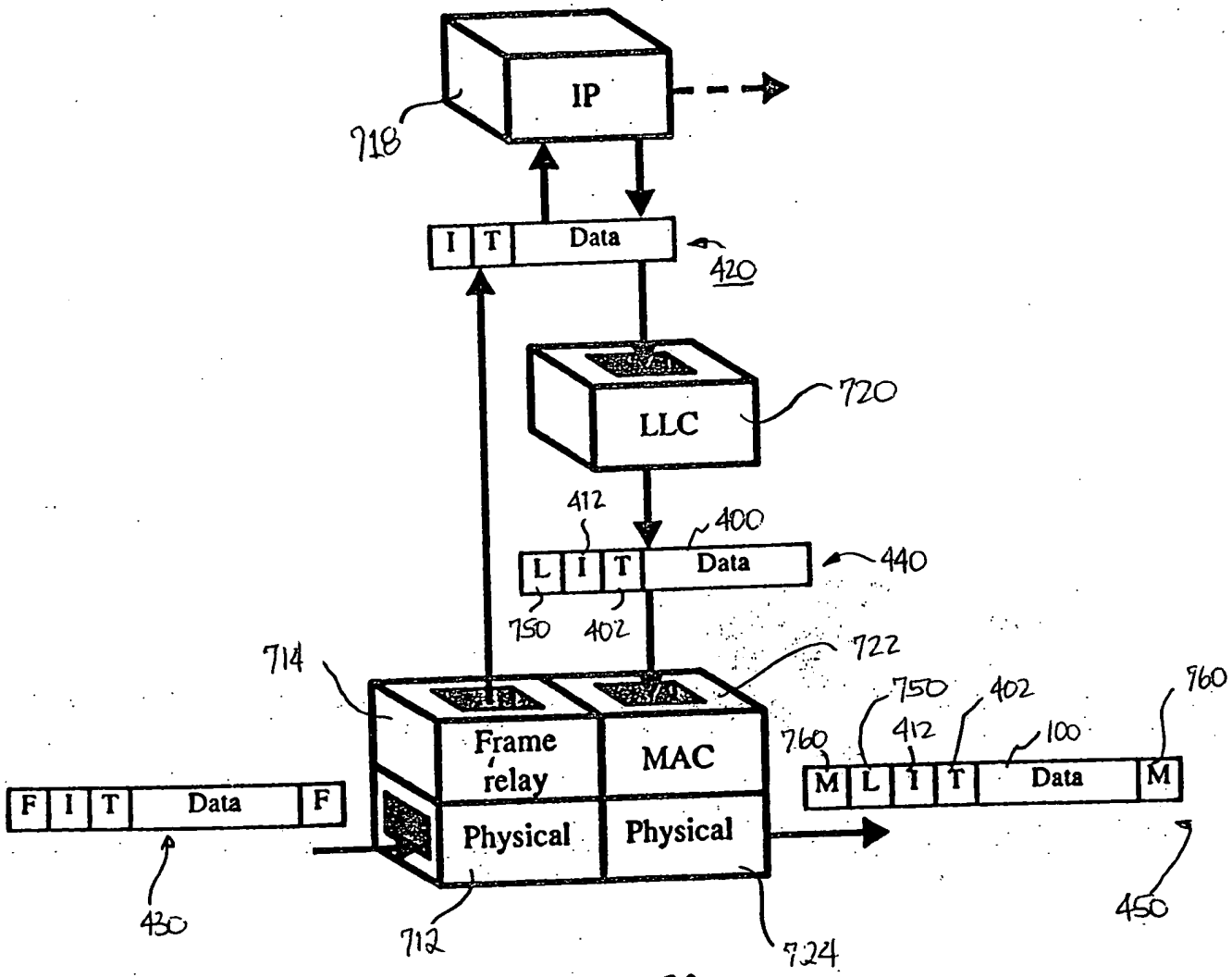


FIGURE 7B

09595960 - 062600

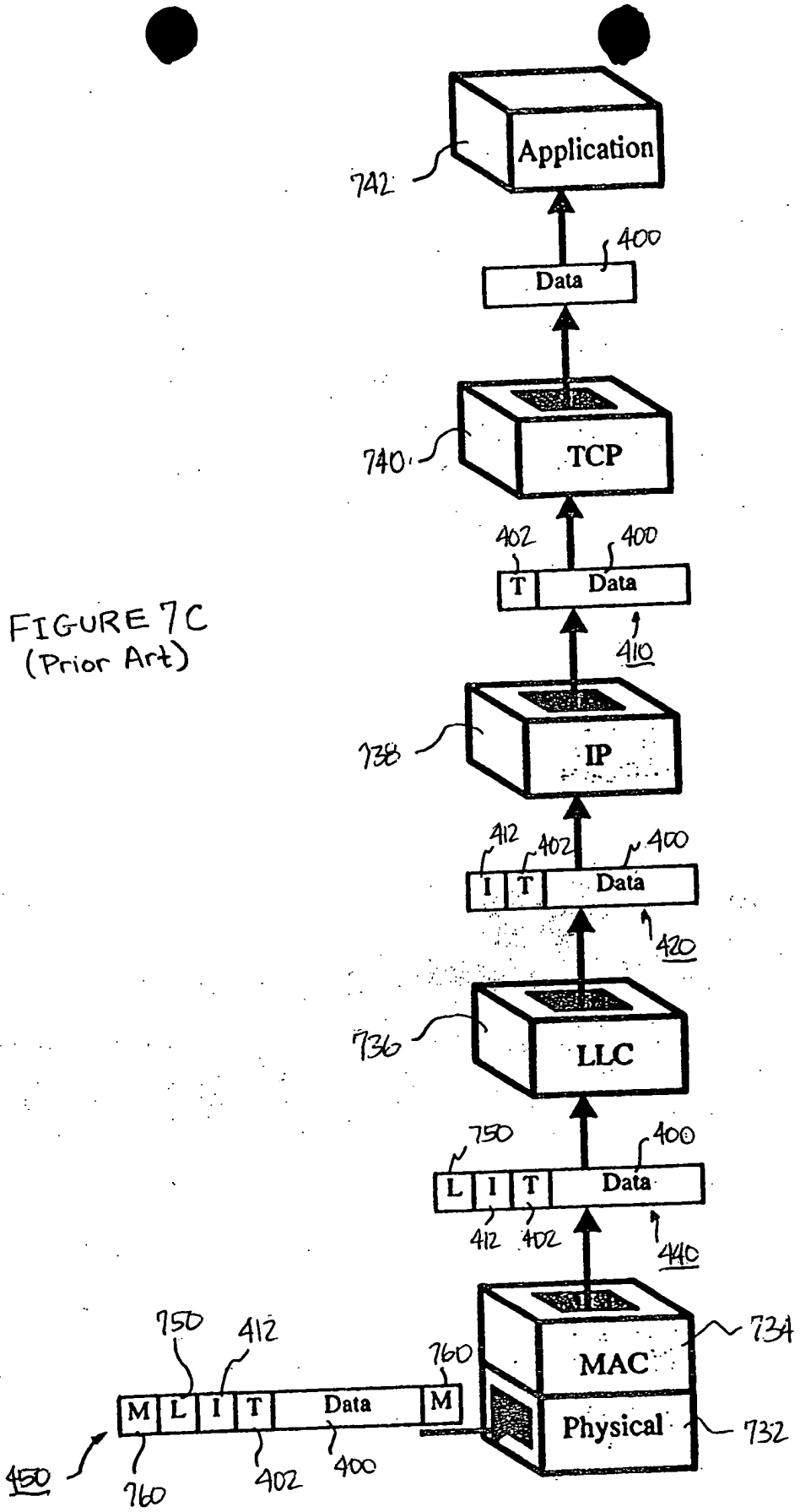


FIGURE 7C
(Prior Art)

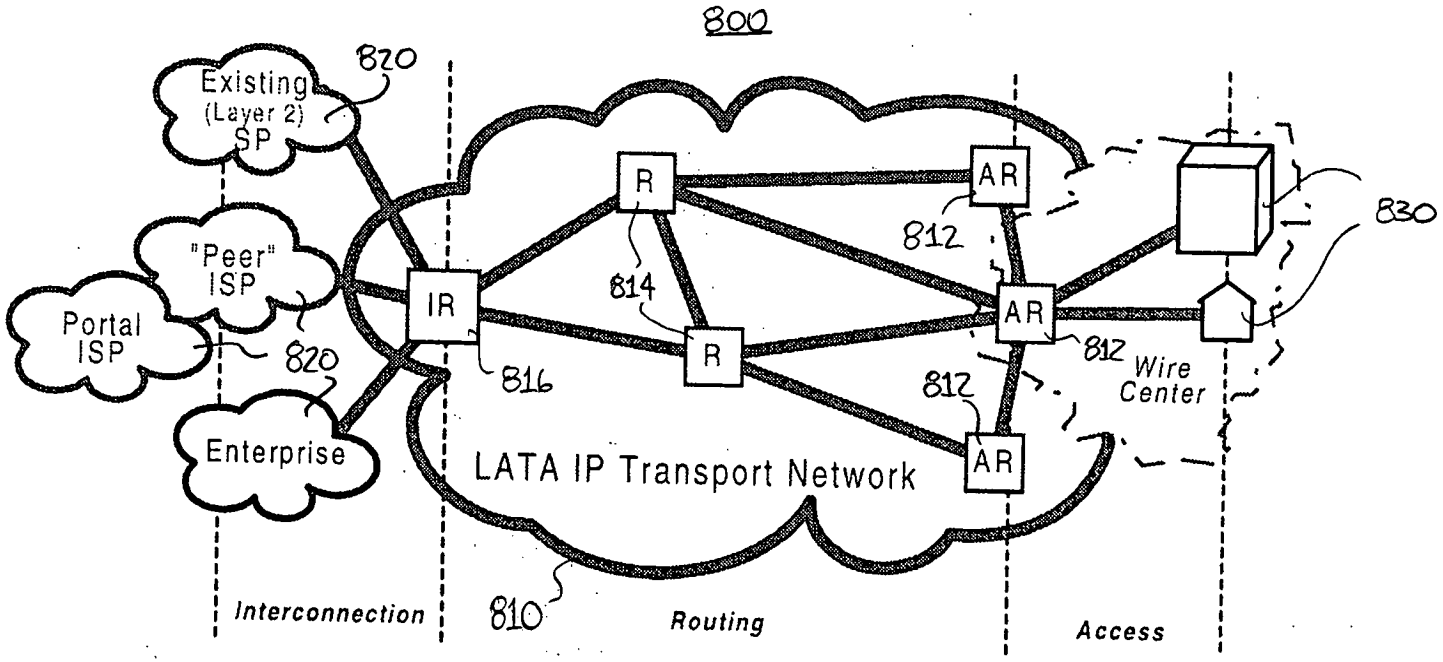

800
820
Existing (Layer 2) SP
"Peer" ISP
Portal ISP
820
Enterprise
IR
816
R
814
R
R
AR
812
AR
812
AR
812
812
Wire Center
830
LATA IP Transport Network
810
Interconnection
Routing
Access

FIGURE 8

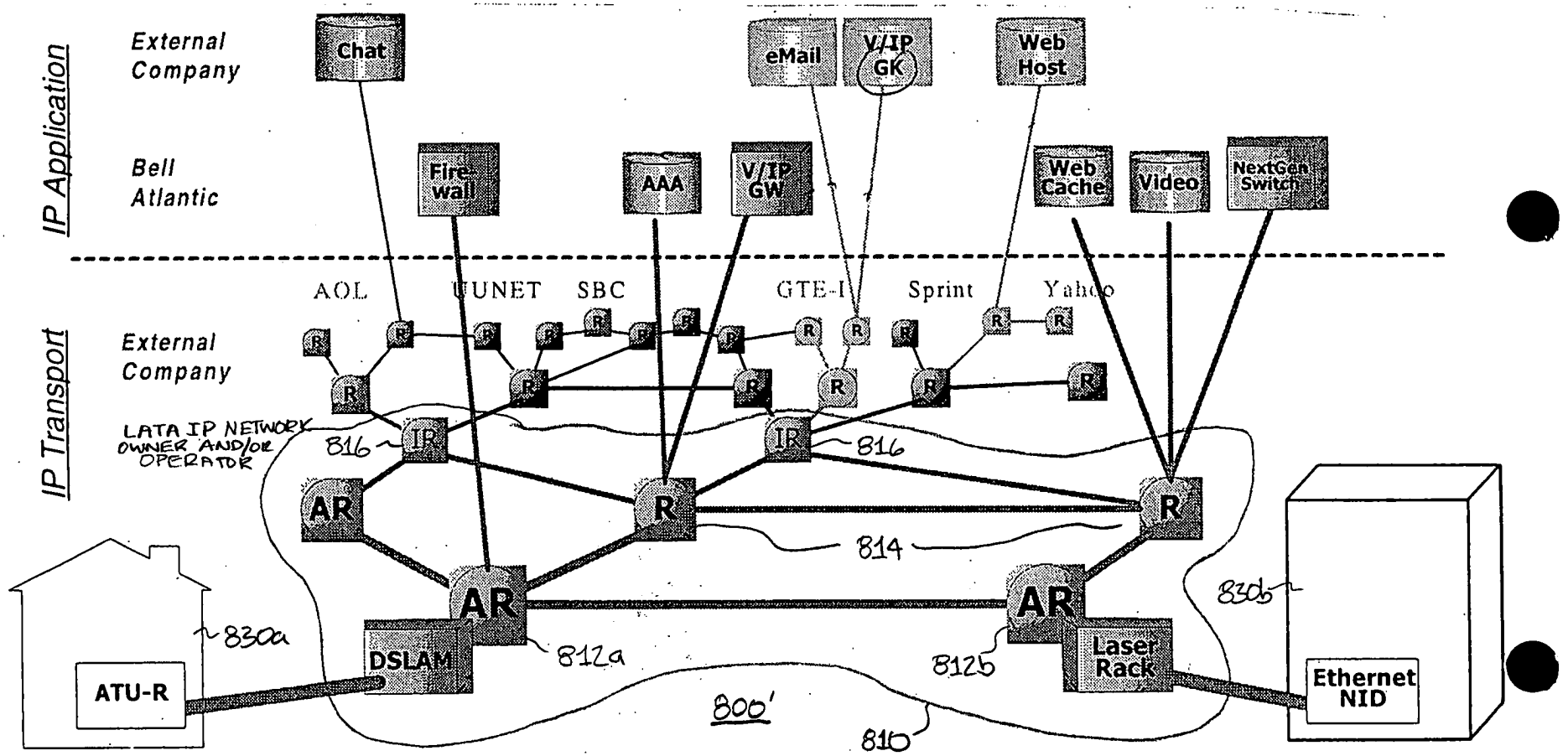

IP Application
IP Transport
External Company
Bell Atlantic
External Company
Chat
eMail
V/IP GK
Web Host
Fire-wall
AAA
V/IP GW
Web Cache
Video
NextGen Switch
AOL
UUNET
SBC
GTE-I
Sprint
Yahoo
LATA IP NETWORK OWNER AND/OR OPERATOR
816
816
814
830a
830b
812a
812b
800'
810
ATU-R
DSLAM
Laser Rack
Ethernet NID
AR
IR
R

FIGURE 9

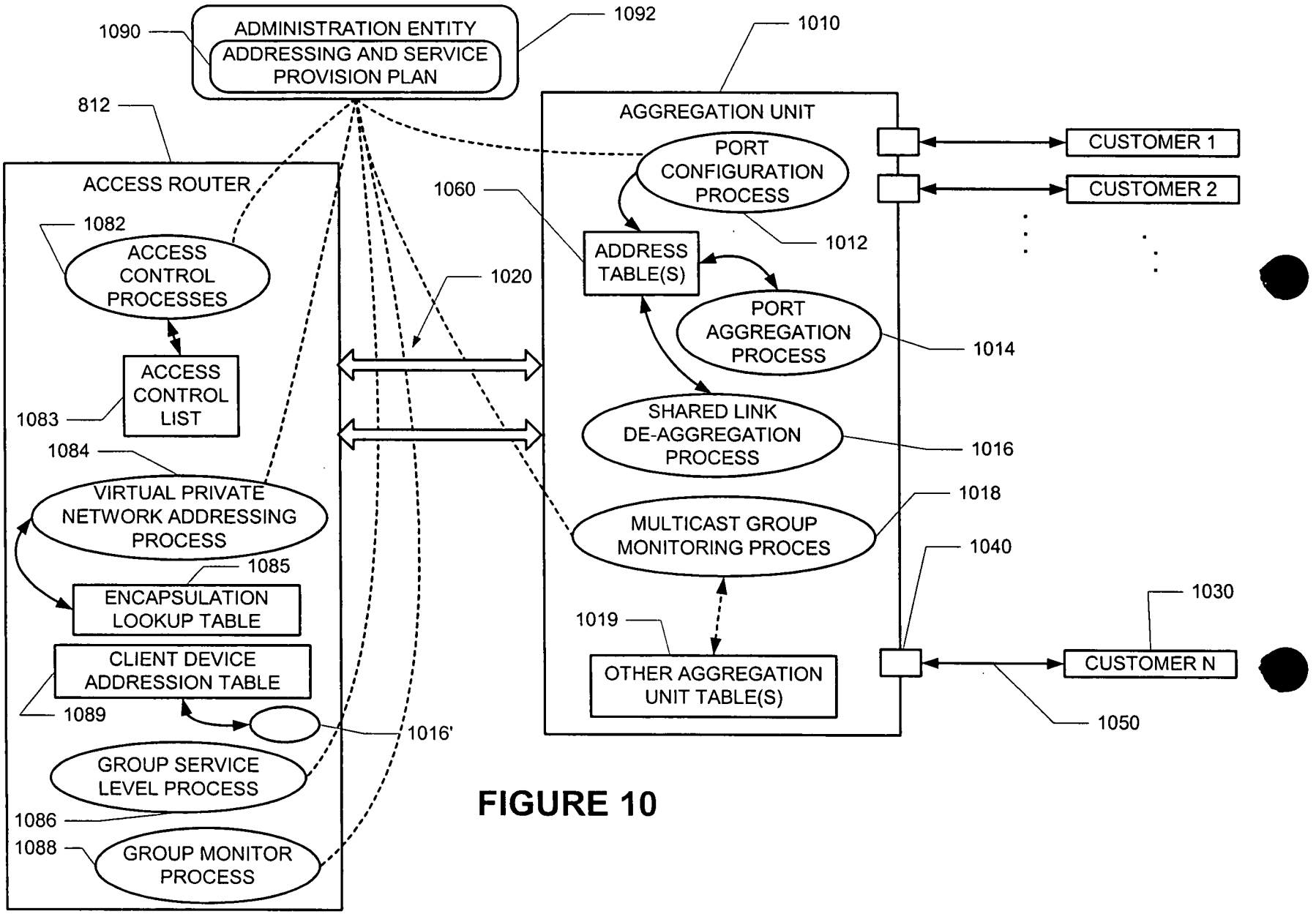

1090
ADMINISTRATION ENTITY
ADDRESSING AND SERVICE PROVISION PLAN
1092
1010
812
AGGREGATION UNIT
ACCESS ROUTER
PORT CONFIGURATION PROCESS
CUSTOMER 1
CUSTOMER 2
1060
1012
1082
ACCESS CONTROL PROCESSES
ADDRESS TABLE(S)
1020
PORT AGGREGATION PROCESS
1014
ACCESS CONTROL LIST
1083
SHARED LINK DE-AGGREGATION PROCESS
1016
1084
VIRTUAL PRIVATE NETWORK ADDRESSING PROCESS
1018
MULTICAST GROUP MONITORING PROCES
1040
1085
ENCAPSULATION LOOKUP TABLE
1030
1019
CLIENT DEVICE ADDRESSION TABLE
OTHER AGGREGATION UNIT TABLE(S)
CUSTOMER N
1089
1016'
1050
GROUP SERVICE LEVEL PROCESS
1086
1088
GROUP MONITOR PROCESS

FIGURE 10

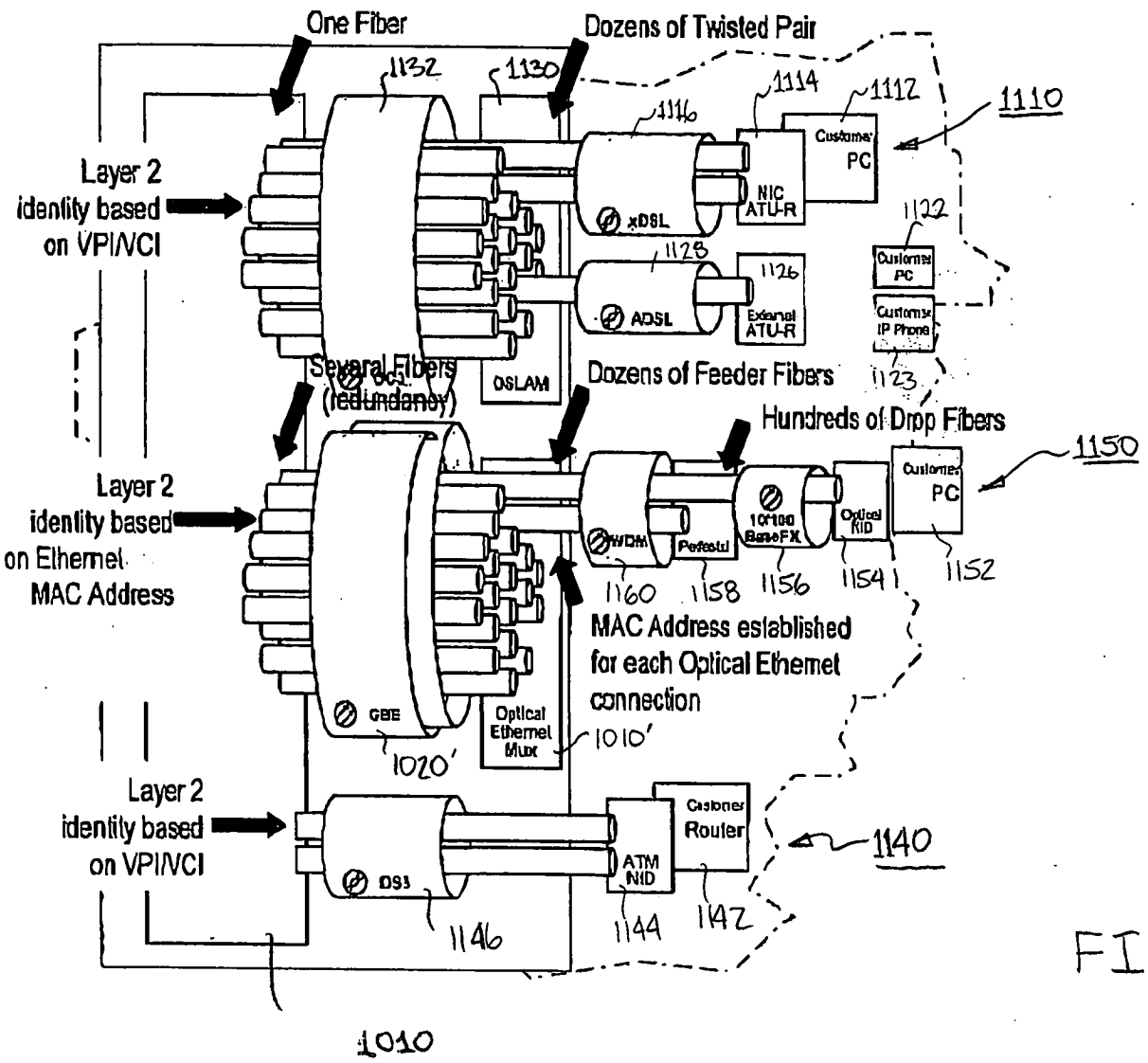
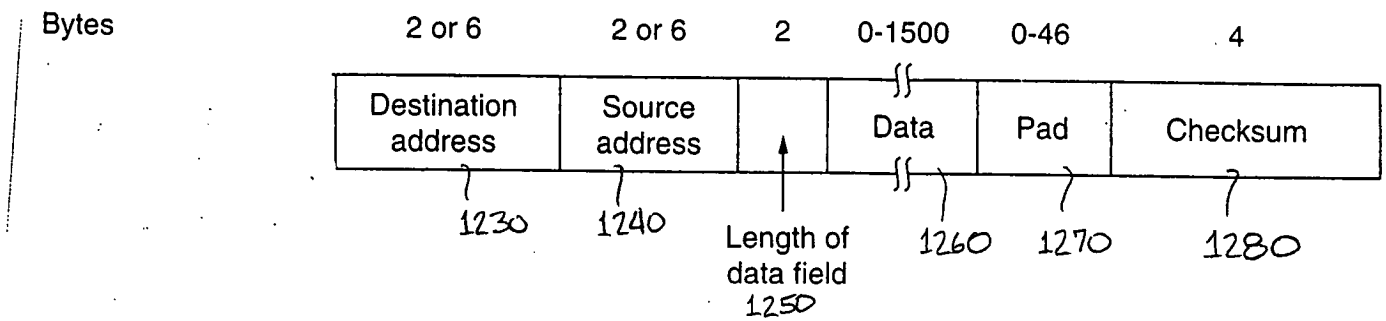

One Fiber
Dozens of Twisted Pair
1132
1130
1114
1112
1110
1116
Layer 2
identity based
on VPI/VCI
xDSL
NIC
ATU-R
Customer
PC
1122
1128
1126
ADSL
External
ATU-R
Customer
PC
Customer
IP Phone
1123
Several Fibers
(redundancy)
OSLAM
Dozens of Feeder Fibers
Hundreds of Drop Fibers
1150
Layer 2
identity based
on Ethernet
MAC Address
WDM
Pedestal
10/100
BaseFX
Optical
NID
Customer
PC
1160
1158
1156
1154
1152
MAC Address established
for each Optical Ethernet
connection
GBE
Optical
Ethernet
Mux
1020'
1010'
Layer 2
identity based
on VPI/VCI
Customer
Router
1140
DS3
ATM
NID
1146
1144
1142
1010

FIGURE 11

FIGURE 12


1200
Bytes
2 or 6
2 or 6
2
0-1500
0-46
4
Destination address
Source address
Data
Pad
Checksum
1230
1240
Length of data field
1250
1260
1270
1280

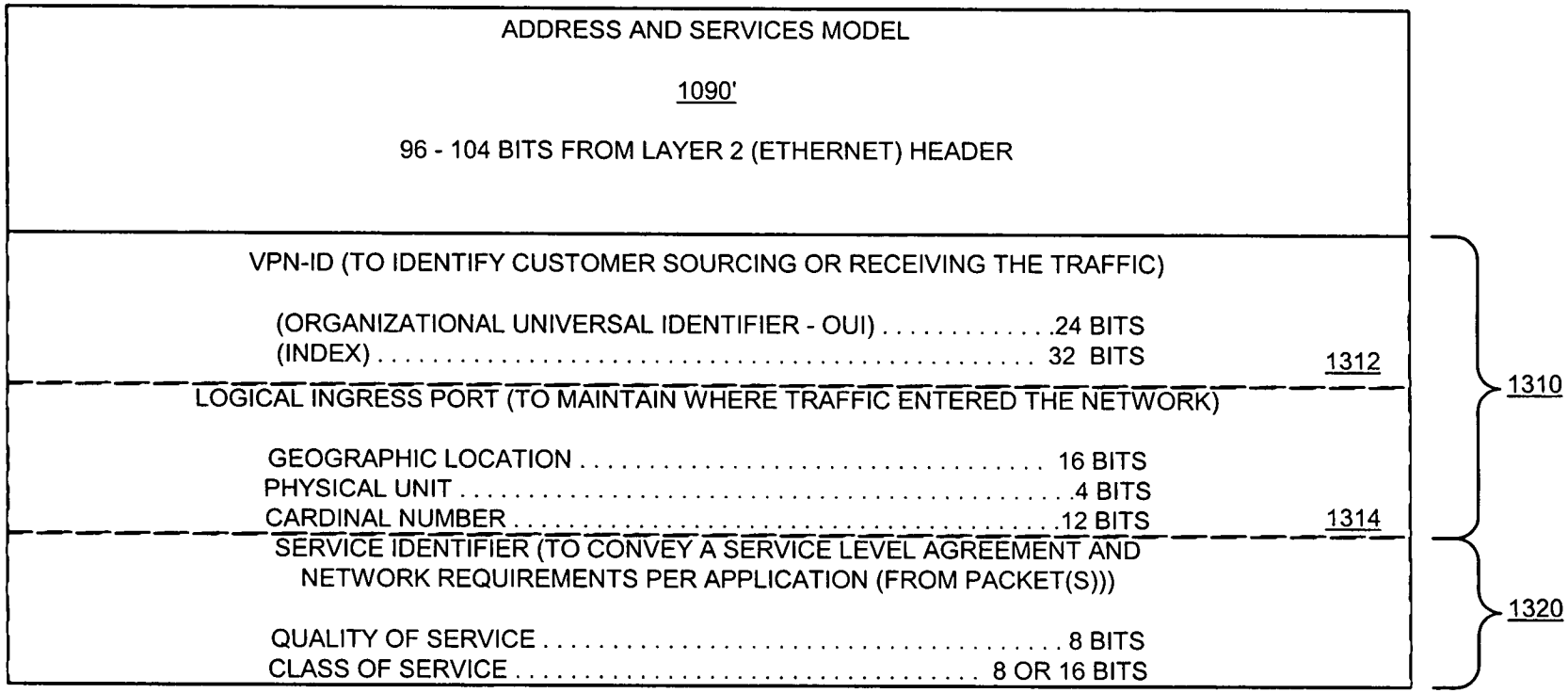

ADDRESS AND SERVICES MODEL
1090'
96 - 104 BITS FROM LAYER 2 (ETHERNET) HEADER
VPN-ID (TO IDENTIFY CUSTOMER SOURCING OR RECEIVING THE TRAFFIC)
(ORGANIZATIONAL UNIVERSAL IDENTIFIER - OUI) . . . . . .24 BITS
(INDEX) . . . . . 32 BITS
1312
LOGICAL INGRESS PORT (TO MAINTAIN WHERE TRAFFIC ENTERED THE NETWORK)
GEOGRAPHIC LOCATION . . . . . 16 BITS
PHYSICAL UNIT . . . . . .4 BITS
CARDINAL NUMBER . . . . . .12 BITS
1314
1310
SERVICE IDENTIFIER (TO CONVEY A SERVICE LEVEL AGREEMENT AND NETWORK REQUIREMENTS PER APPLICATION (FROM PACKET(S)))
QUALITY OF SERVICE . . . . . 8 BITS
CLASS OF SERVICE . . . . . 8 OR 16 BITS
1320

FIGURE 13

DOCUMENT: 0050

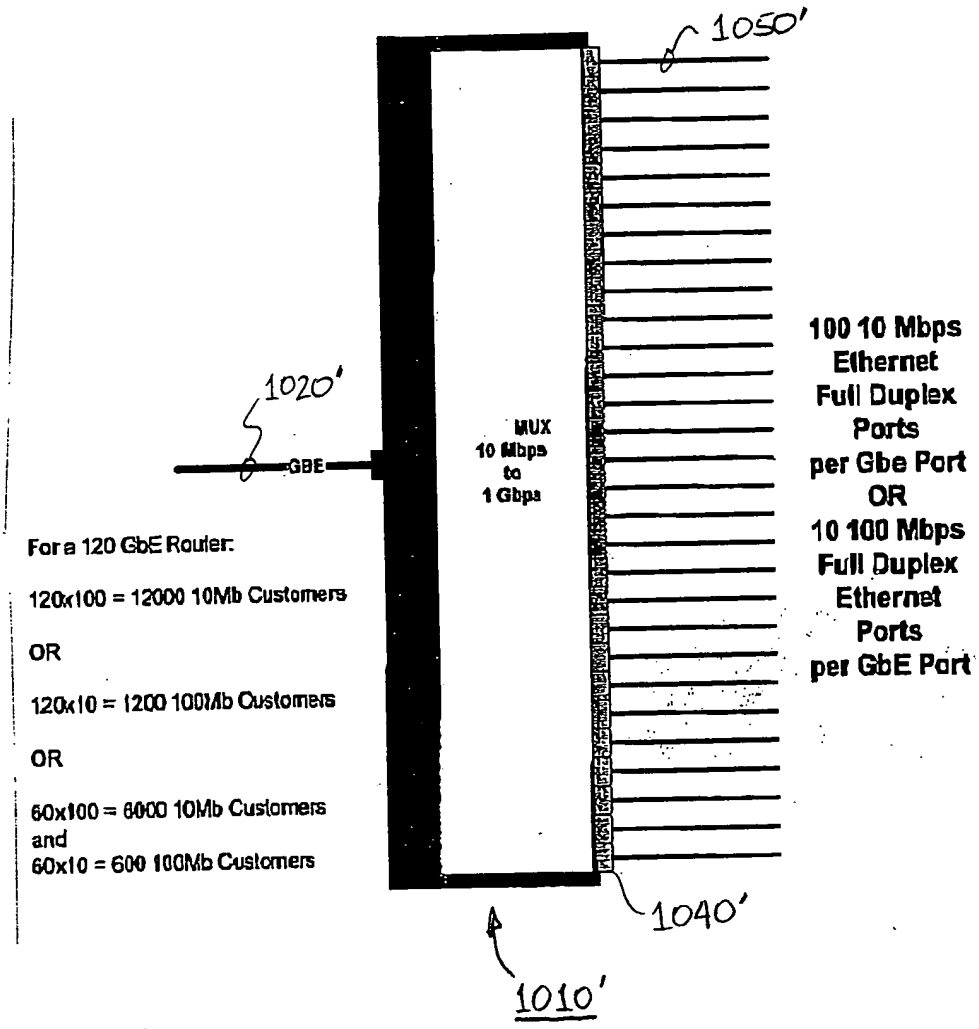
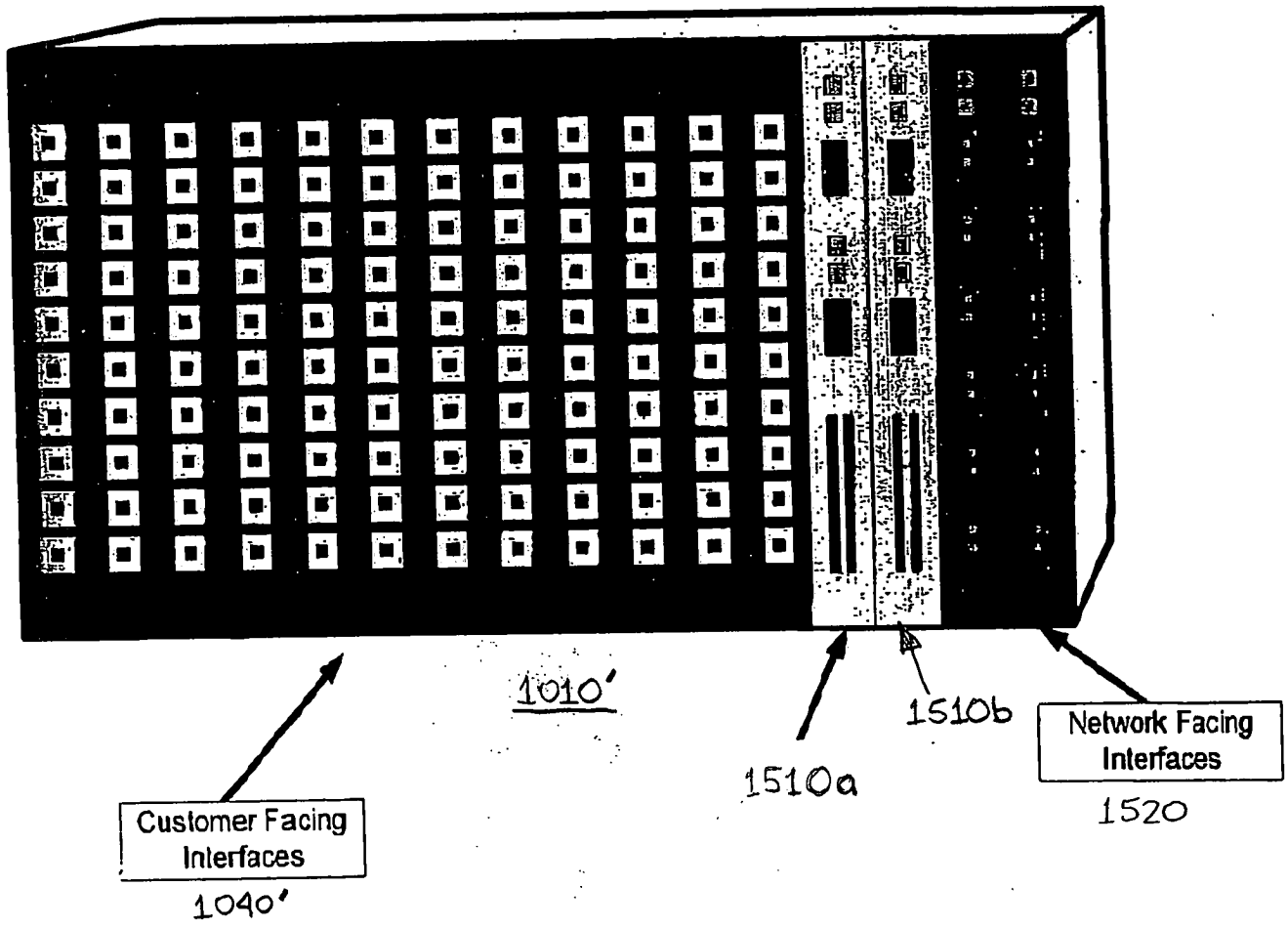


FIGURE 14

FIGURE 15


1010'
1510b
Network Facing Interfaces
1520
1510a
Customer Facing Interfaces
1040'

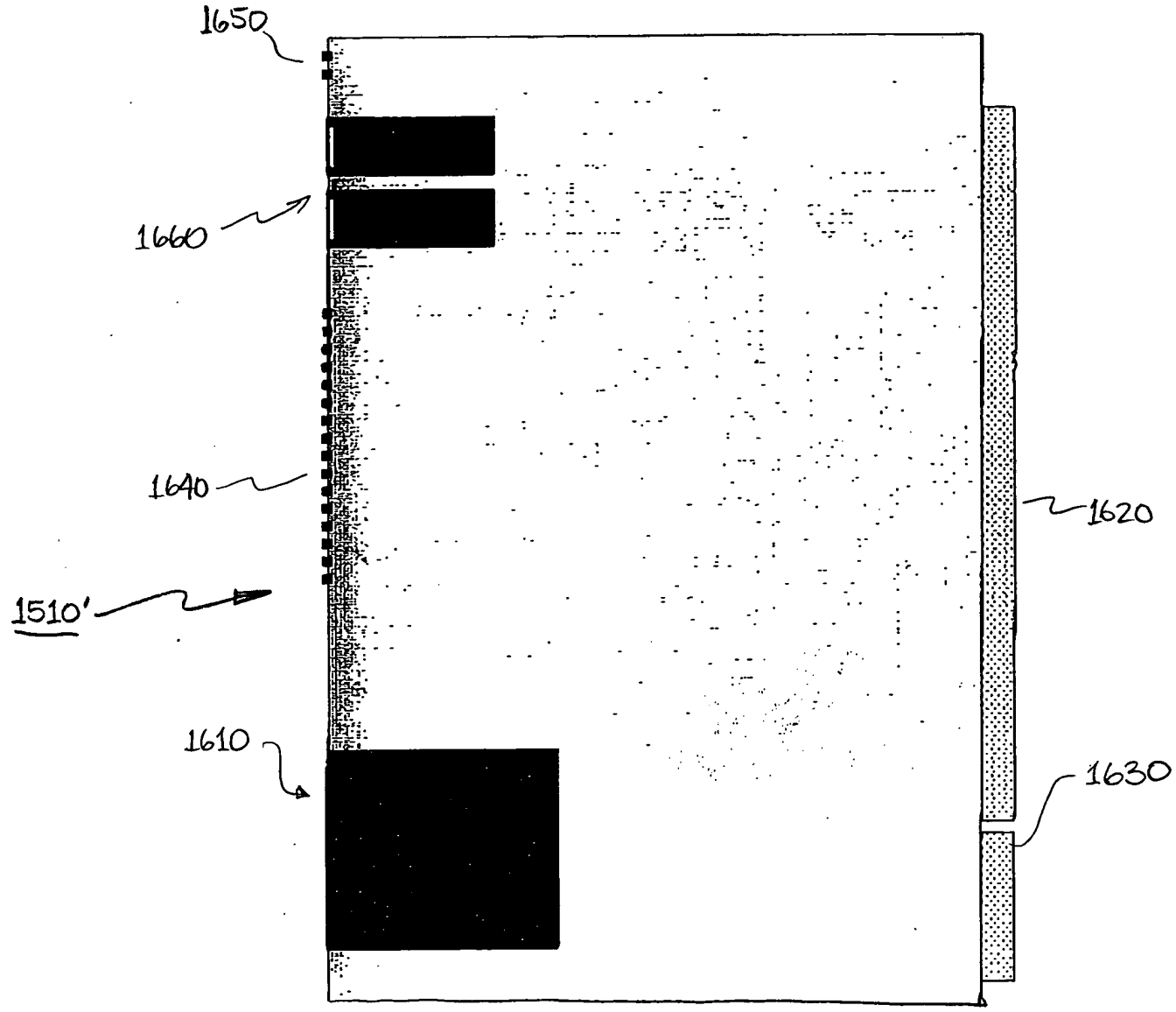


FIGURE 16

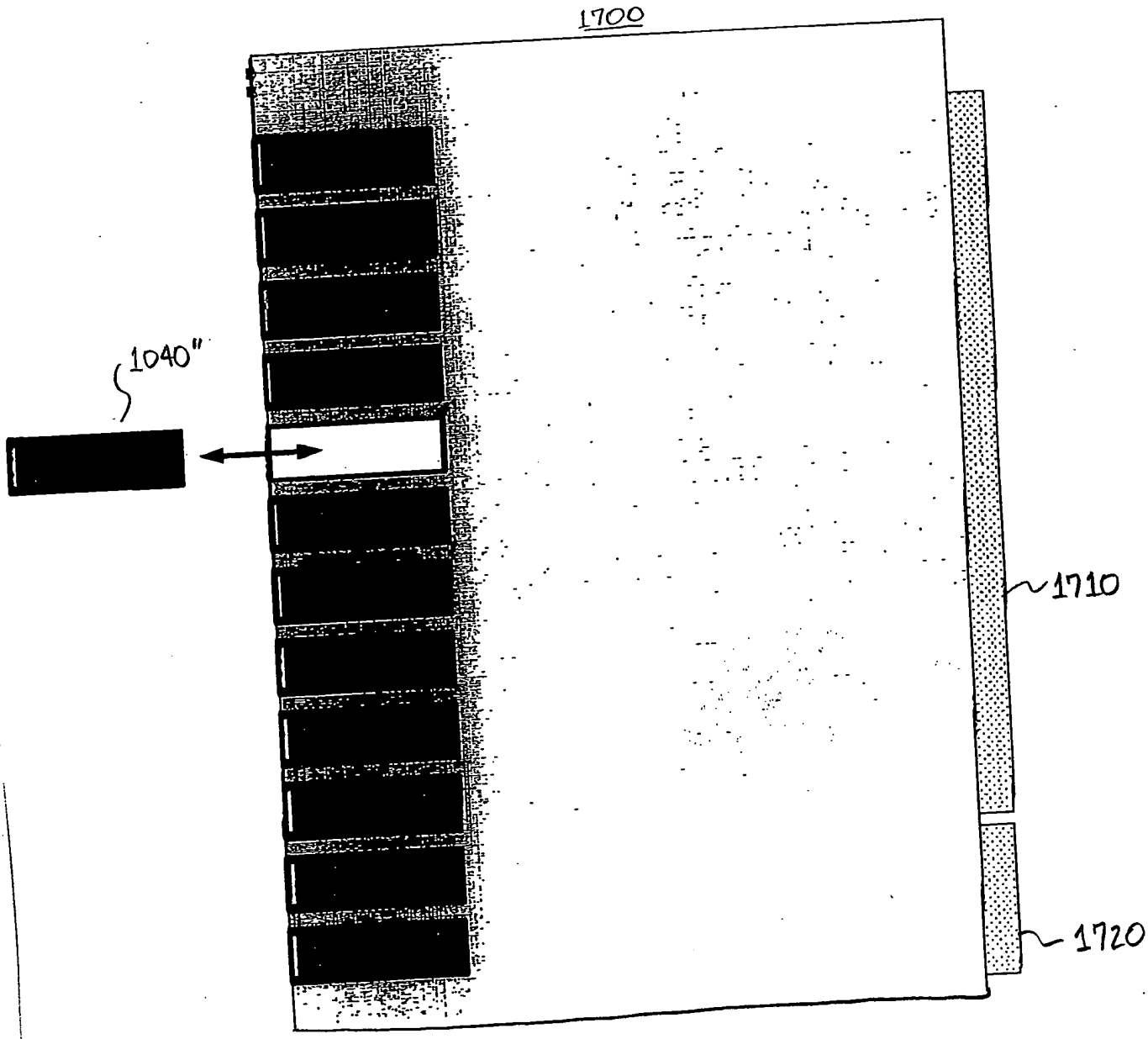


FIGURE 17

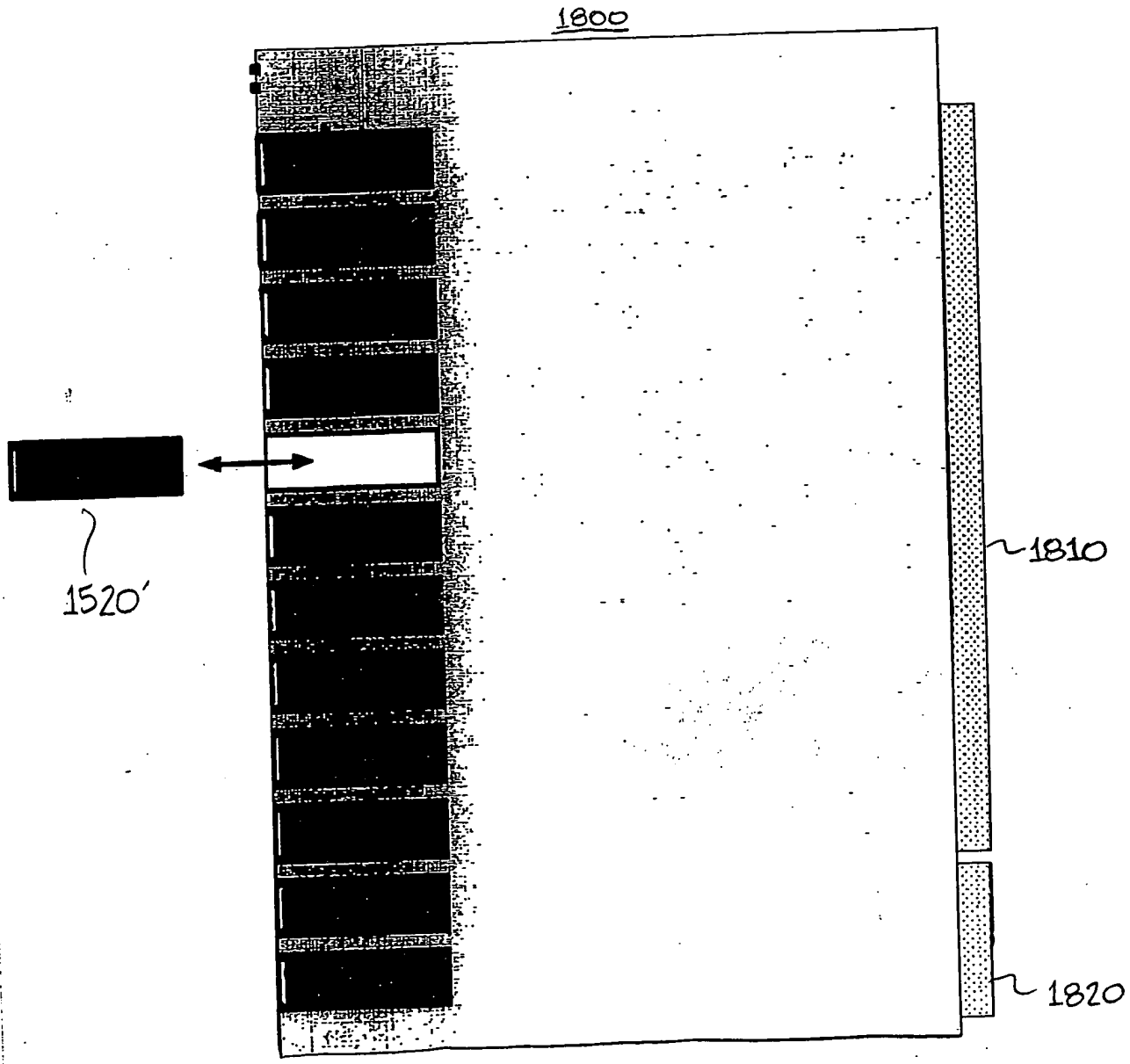


FIGURE 18

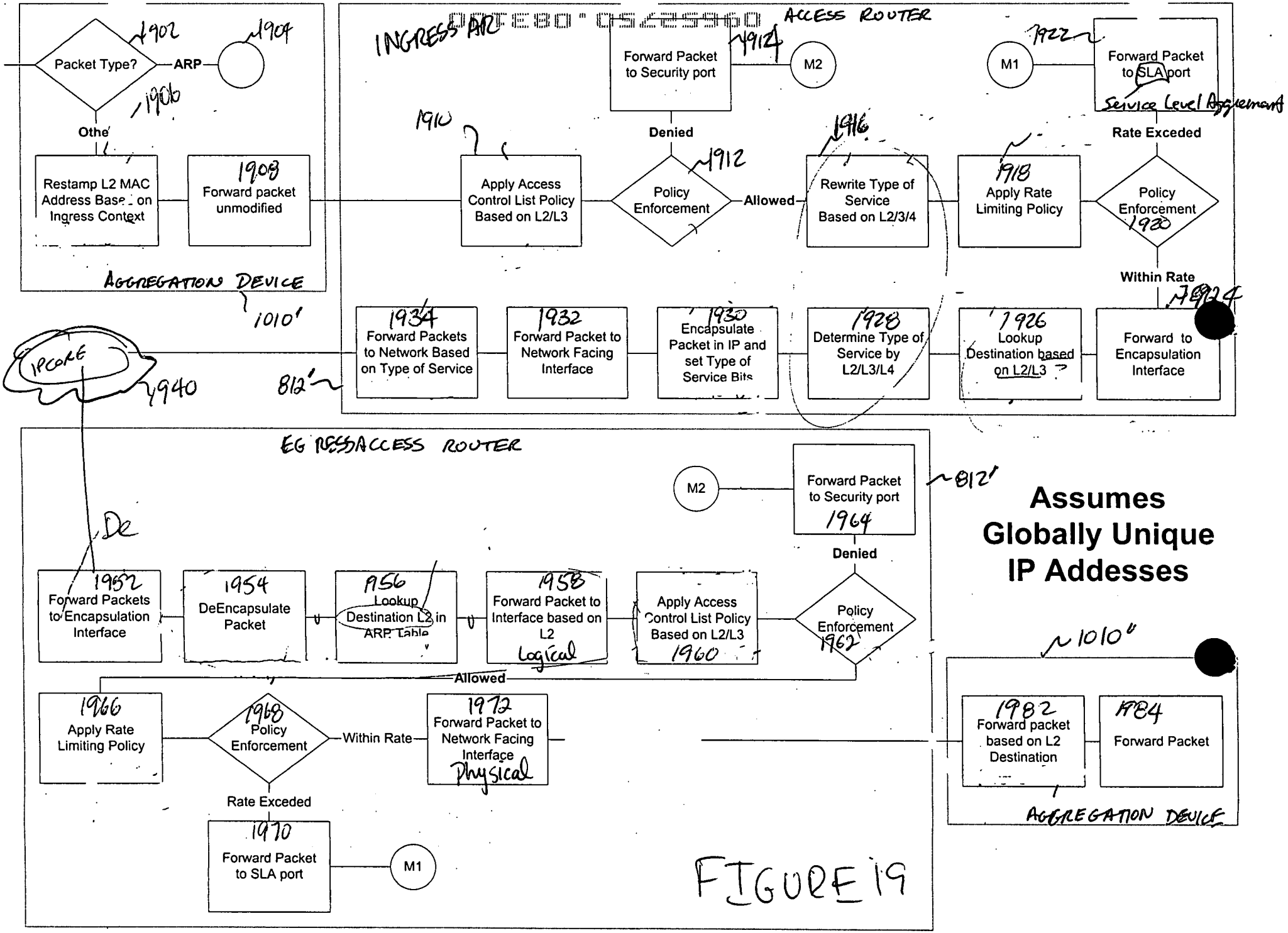

INGRESS ARE
ACCESS ROUTER
Packet Type?
1902
ARP
1904
1906
Other
Restamp L2 MAC Address Based on Ingress Context
1908
Forward packet unmodified
AGGREGATION DEVICE
1010'
Forward Packet to Security port
1914
M2
Denied
1910
Apply Access Control List Policy Based on L2/L3
Policy Enforcement
1912
Allowed
1916
Rewrite Type of Service Based on L2/3/4
1918
Apply Rate Limiting Policy
M1
1922
Forward Packet to SLA port
Service Level Agreement
Rate Exceded
Policy Enforcement
1920
Within Rate
1924
IPCORE
1940
812'
1934
Forward Packets to Network Based on Type of Service
1932
Forward Packet to Network Facing Interface
1930
Encapsulate Packet in IP and set Type of Service Bits
1928
Determine Type of Service by L2/L3/L4
1926
Lookup Destination based on L2/L3
Forward to Encapsulation Interface
EGRESS ACCESS ROUTER
812'
M2
Forward Packet to Security port
1964
Denied
1952
Forward Packets to Encapsulation Interface
1954
DeEncapsulate Packet
1956
Lookup Destination L2 in ARP Table
1958
Forward Packet to Interface based on L2
Logical
Apply Access Control List Policy Based on L2/L3
1960
Policy Enforcement
1962
Allowed
1966
Apply Rate Limiting Policy
1968
Policy Enforcement
Within Rate
1972
Forward Packet to Network Facing Interface
Physical
Rate Exceded
1970
Forward Packet to SLA port
M1
1010"
1982
Forward packet based on L2 Destination
1984
Forward Packet
AGGREGATION DEVICE
Assumes Globally Unique IP Addesses

FIGURE 19

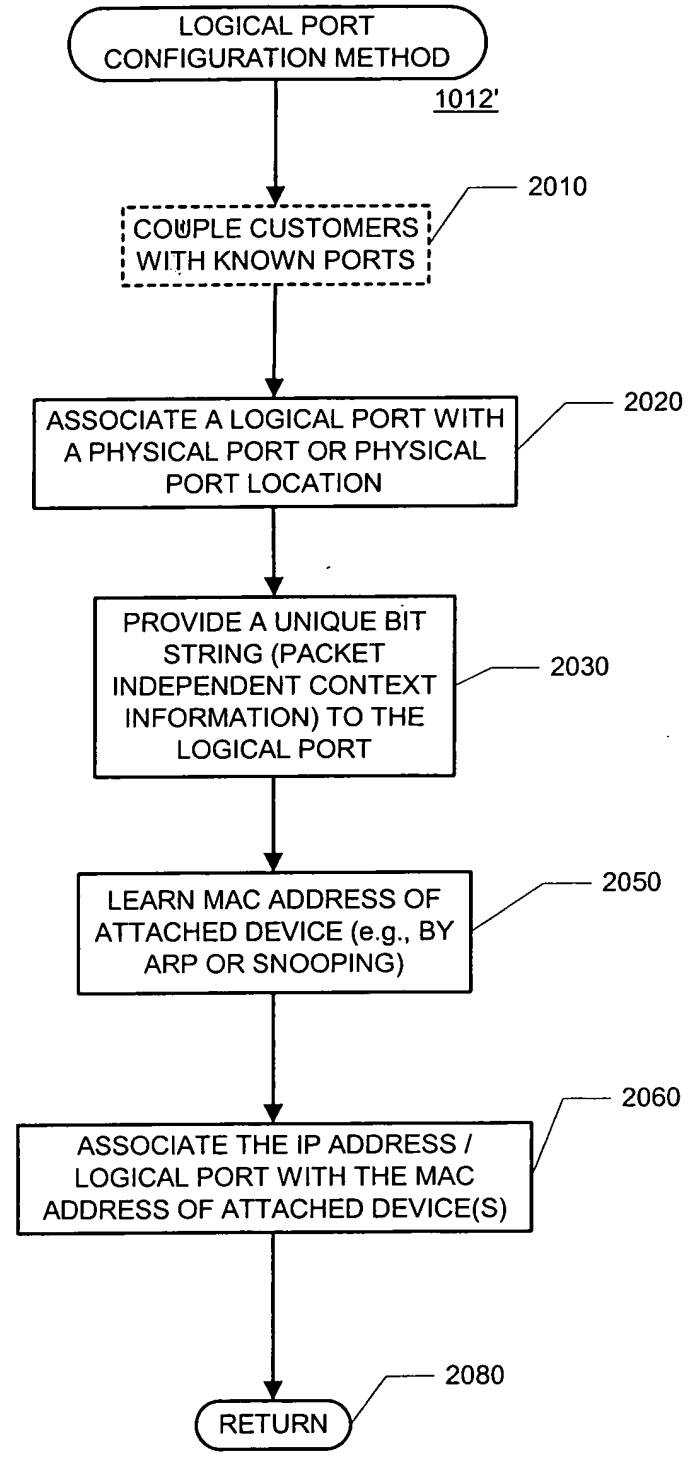

LOGICAL PORT CONFIGURATION METHOD
1012'
2010
COUPLE CUSTOMERS WITH KNOWN PORTS
2020
ASSOCIATE A LOGICAL PORT WITH A PHYSICAL PORT OR PHYSICAL PORT LOCATION
2030
PROVIDE A UNIQUE BIT STRING (PACKET INDEPENDENT CONTEXT INFORMATION) TO THE LOGICAL PORT
2050
LEARN MAC ADDRESS OF ATTACHED DEVICE (e.g., BY ARP OR SNOOPING)
2060
ASSOCIATE THE IP ADDRESS / LOGICAL PORT WITH THE MAC ADDRESS OF ATTACHED DEVICE(S)
2080
RETURN

FIGURE 20

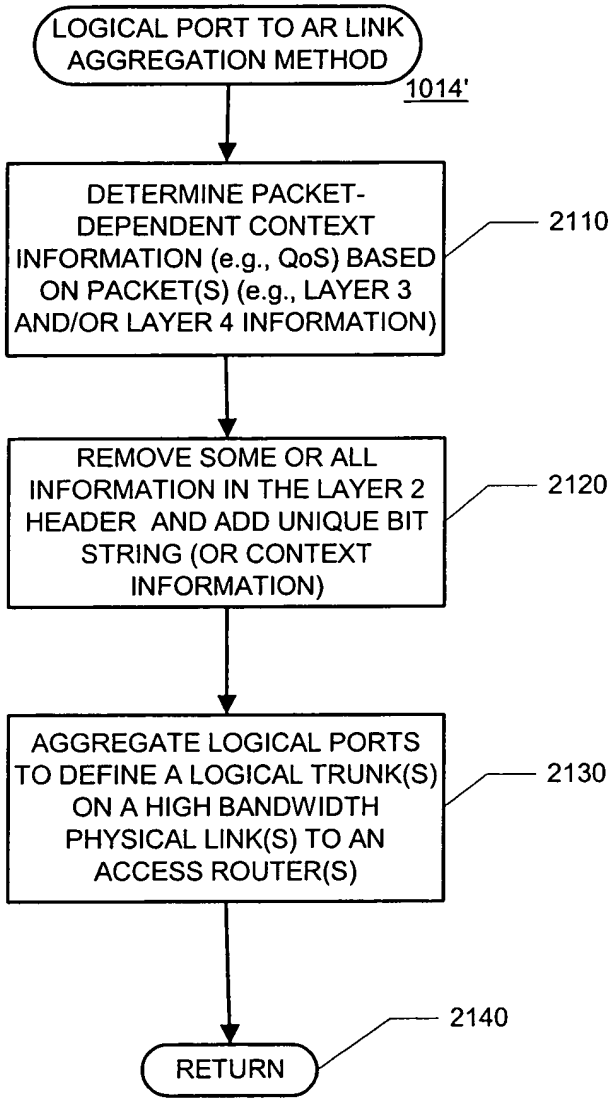

LOGICAL PORT TO AR LINK AGGREGATION METHOD
1014'
DETERMINE PACKET-DEPENDENT CONTEXT INFORMATION (e.g., QoS) BASED ON PACKET(S) (e.g., LAYER 3 AND/OR LAYER 4 INFORMATION)
2110
REMOVE SOME OR ALL INFORMATION IN THE LAYER 2 HEADER AND ADD UNIQUE BIT STRING (OR CONTEXT INFORMATION)
2120
AGGREGATE LOGICAL PORTS TO DEFINE A LOGICAL TRUNK(S) ON A HIGH BANDWIDTH PHYSICAL LINK(S) TO AN ACCESS ROUTER(S)
2130
RETURN
2140

FIGURE 21

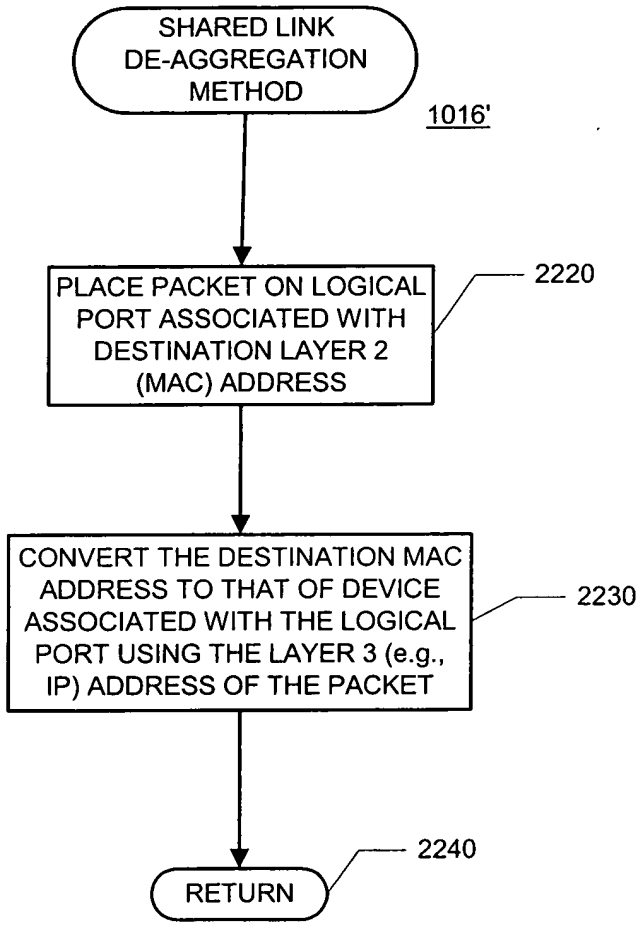

SHARED LINK DE-AGGREGATION METHOD
1016'
PLACE PACKET ON LOGICAL PORT ASSOCIATED WITH DESTINATION LAYER 2 (MAC) ADDRESS
2220
CONVERT THE DESTINATION MAC ADDRESS TO THAT OF DEVICE ASSOCIATED WITH THE LOGICAL PORT USING THE LAYER 3 (e.g., IP) ADDRESS OF THE PACKET
2230
RETURN
2240

FIGURE 22

0015800 - 05/25/2005

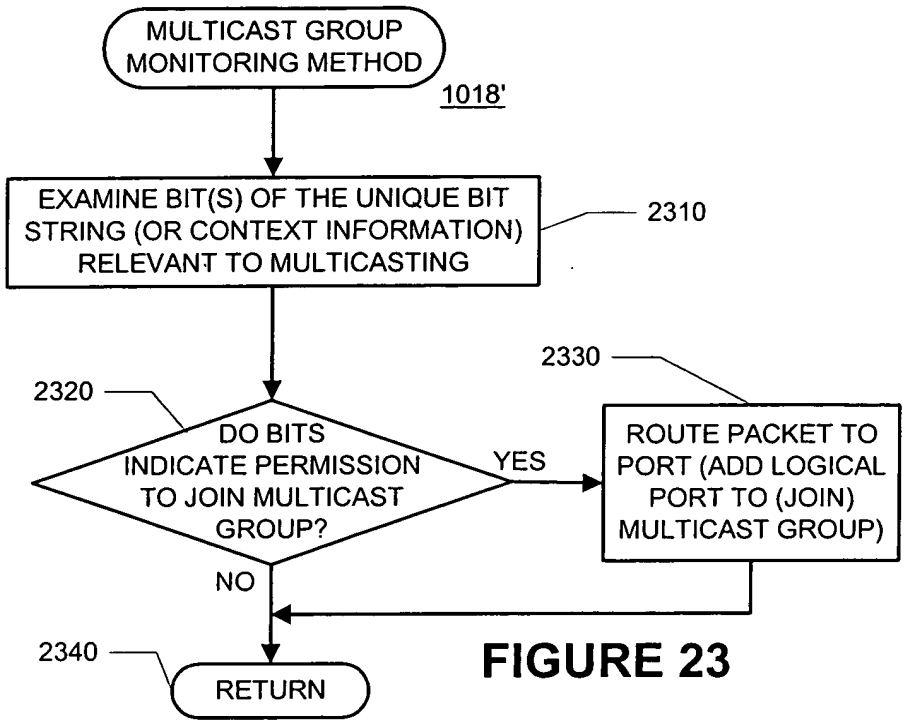


FIGURE 23

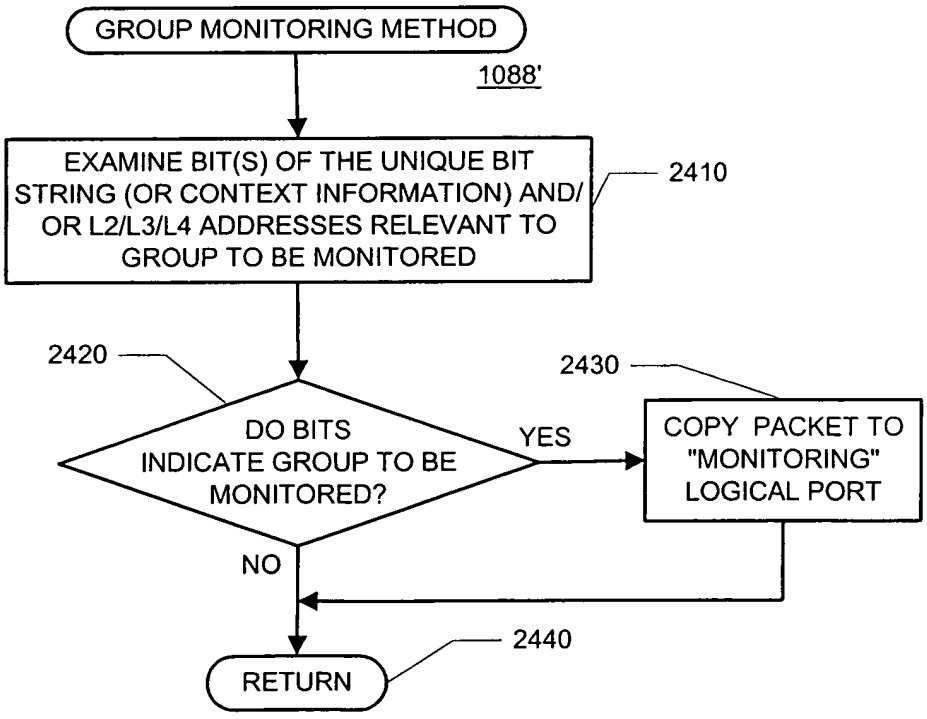


FIGURE 24

Layer 2/3 Access Control

FIG. 25

Context (3225, 3230, 3235, 3240, 3245, 3250) (2510)	L3 Source Address (3205) (2520)	L3 Destination Address (3215) (2530)	Action (2540)
BA Services			
Service Package #1	ANY	Service Address #11	DENY
Service Package #2	ANY	Service Address #12	DENY
Service Package #3	ANY	Service Address #13	DENY
VRPN - No Internet Access			
Context A	100.100.100.0 /24	100.100.101.0/24	PERMIT
Context A	100.100.100.0 /24	200.200.201.0/24	PERMIT
Context A	100.100.100.0 /24	205.205.205.0/24	PERMIT
Context A	ANY	ANY	DENY
VRPN - With Internet Access			
Context B	150.000.100.0/24	150.100.200.0/24	PERMIT
Context B	150.000.100.0/24	150.100.210.0/24	PERMIT
Context B	150.000.100.0/24	150.100.220.0/24	PERMIT
VPRN Internet Access			
Context B	900.900.900.0/24	ANY	PERMIT
Internet Access			
Context C	BA Address Space	ANY	PERMIT
Default Deny			
ANY	ANY	ANY	DENY

DOCKET: 05525.0050

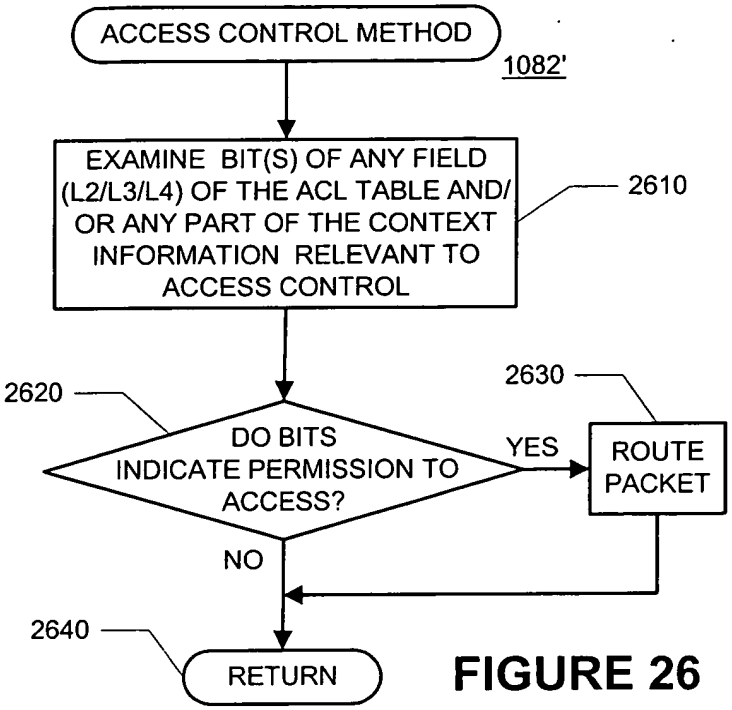
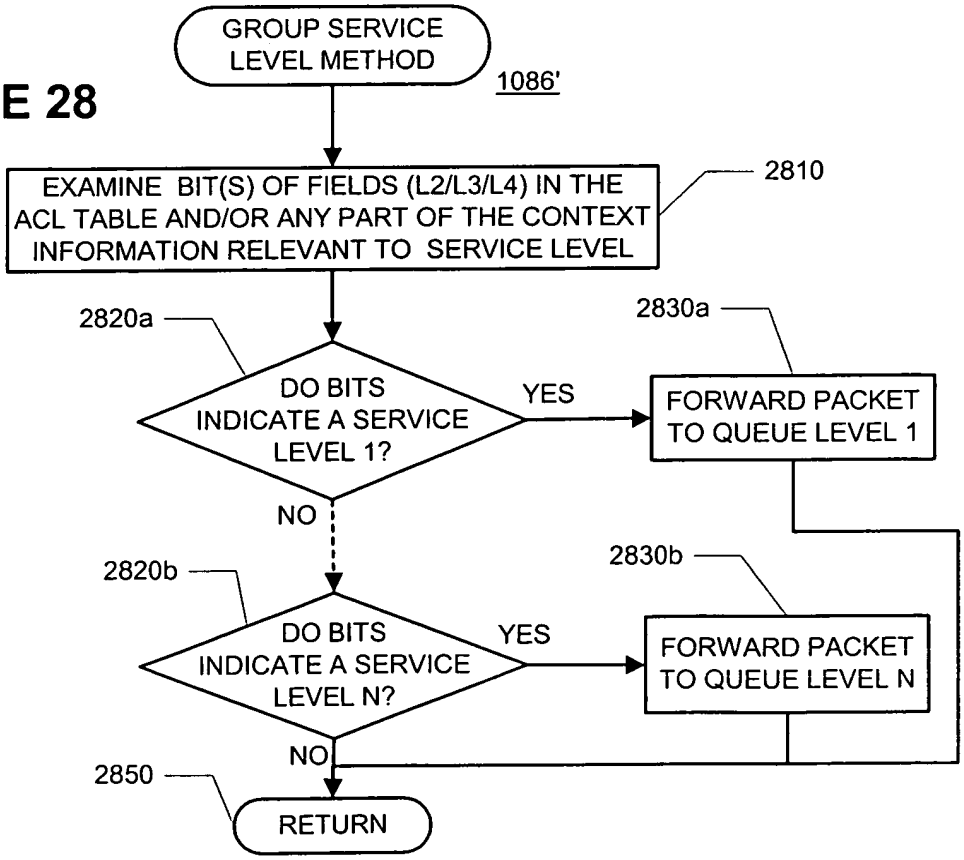


FIGURE 26

FIGURE 28



DOCKET NO. 05-2550

FIGURE 27A

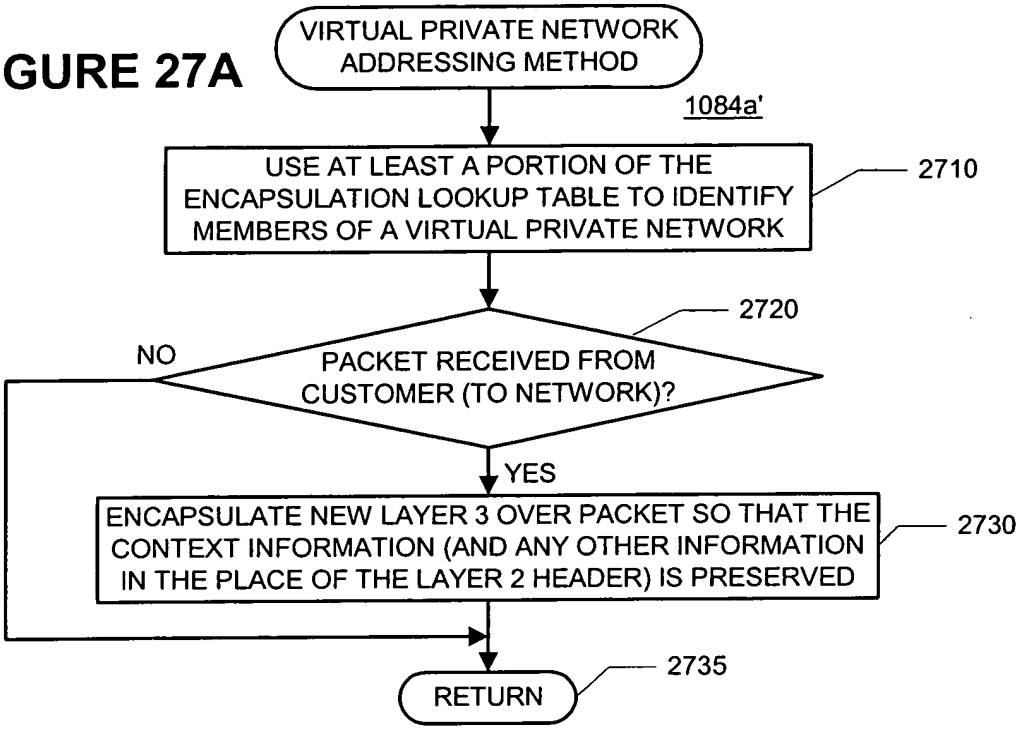
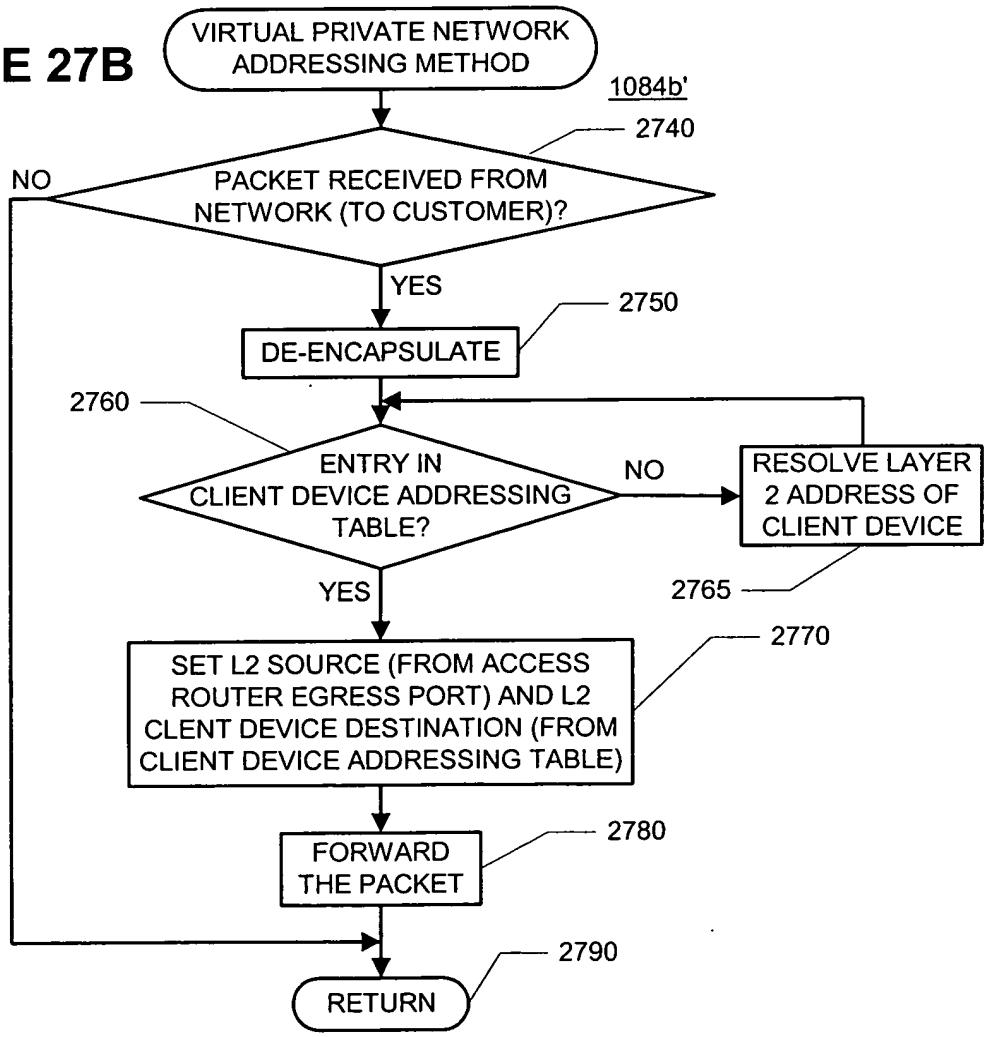


FIGURE 27B



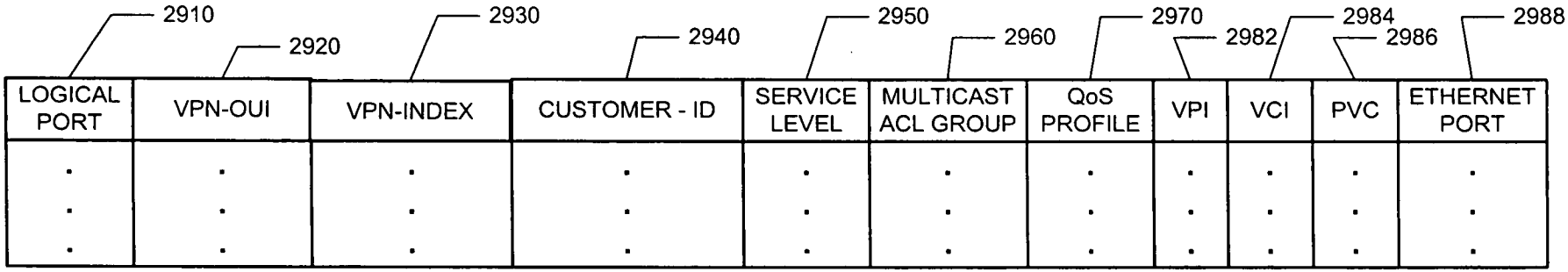


FIGURE 29

1060'

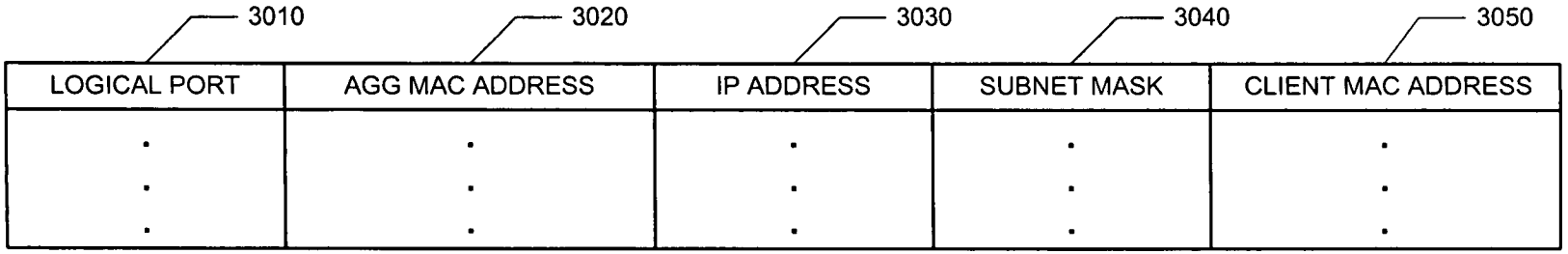


FIGURE 30

1060"

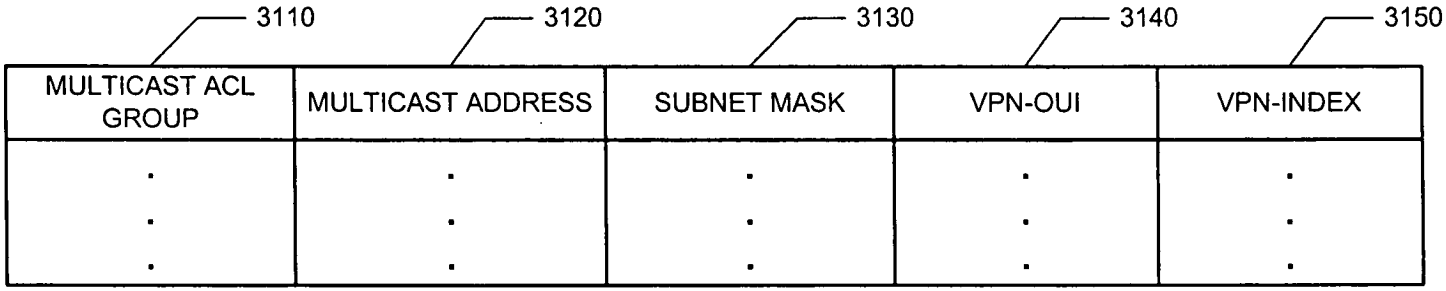


FIGURE 31

1019'

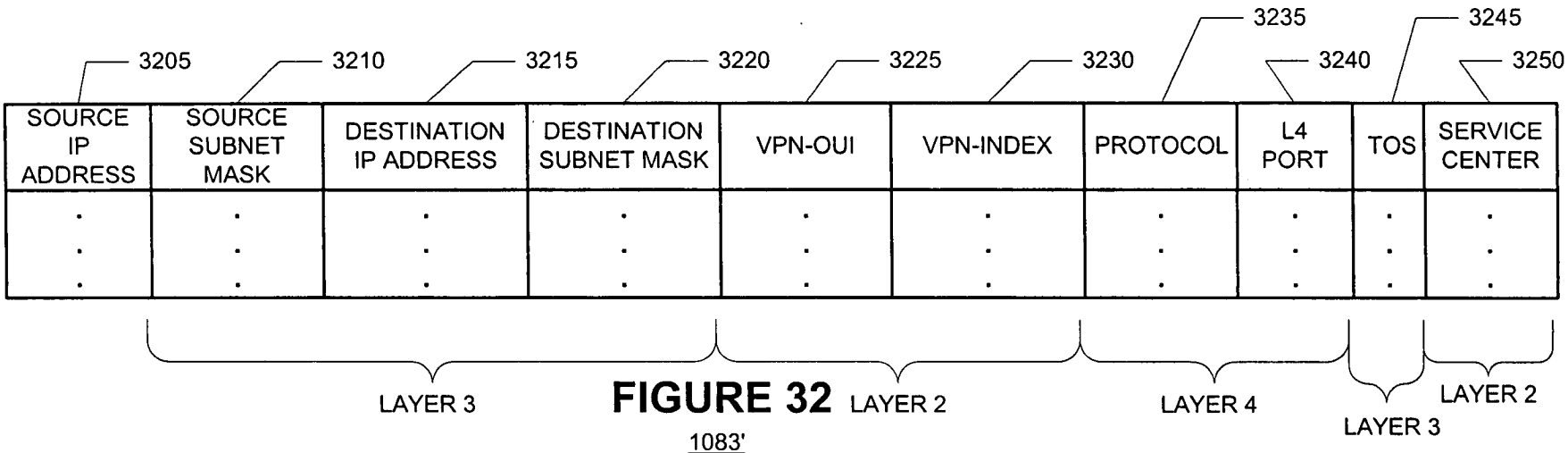


FIGURE 32

1083'

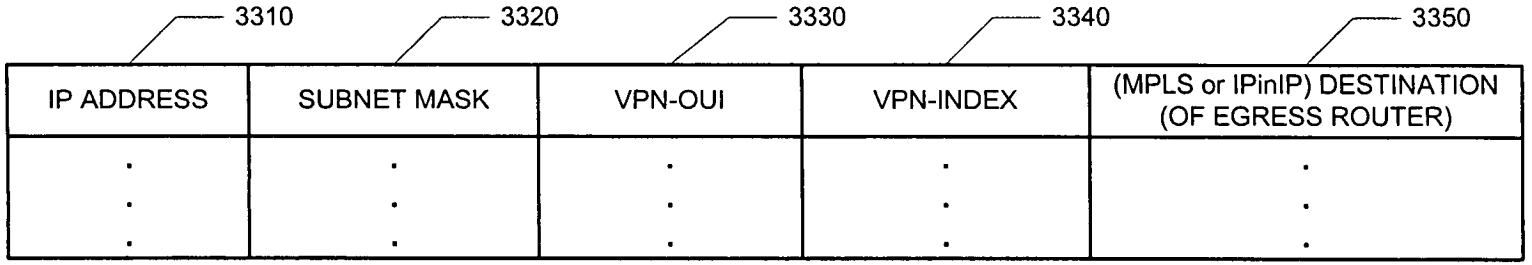


FIGURE 33

1085'

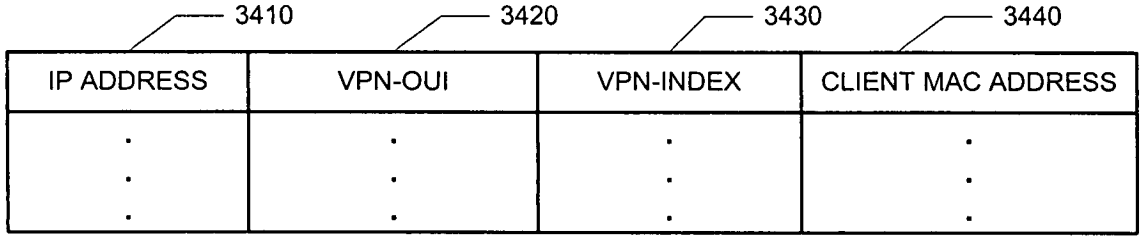


FIGURE 34

1089'

FIGURE 35

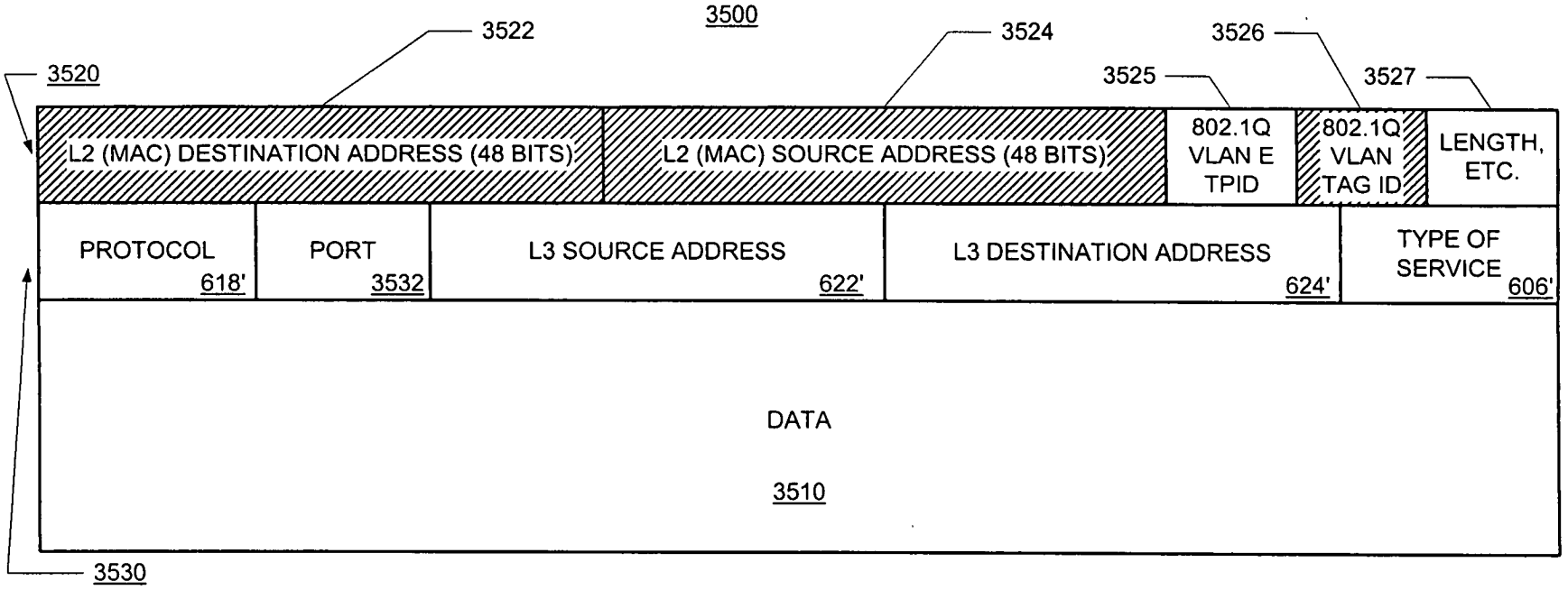

3500
3520
3522
3524
3525
3526
3527
L2 (MAC) DESTINATION ADDRESS (48 BITS)
L2 (MAC) SOURCE ADDRESS (48 BITS)
802.1Q VLAN E TPID
802.1Q VLAN TAG ID
LENGTH, ETC.
PROTOCOL 618'
PORT 3532
L3 SOURCE ADDRESS 622'
L3 DESTINATION ADDRESS 624'
TYPE OF SERVICE 606'
DATA
3510
3530

FIGURE 36

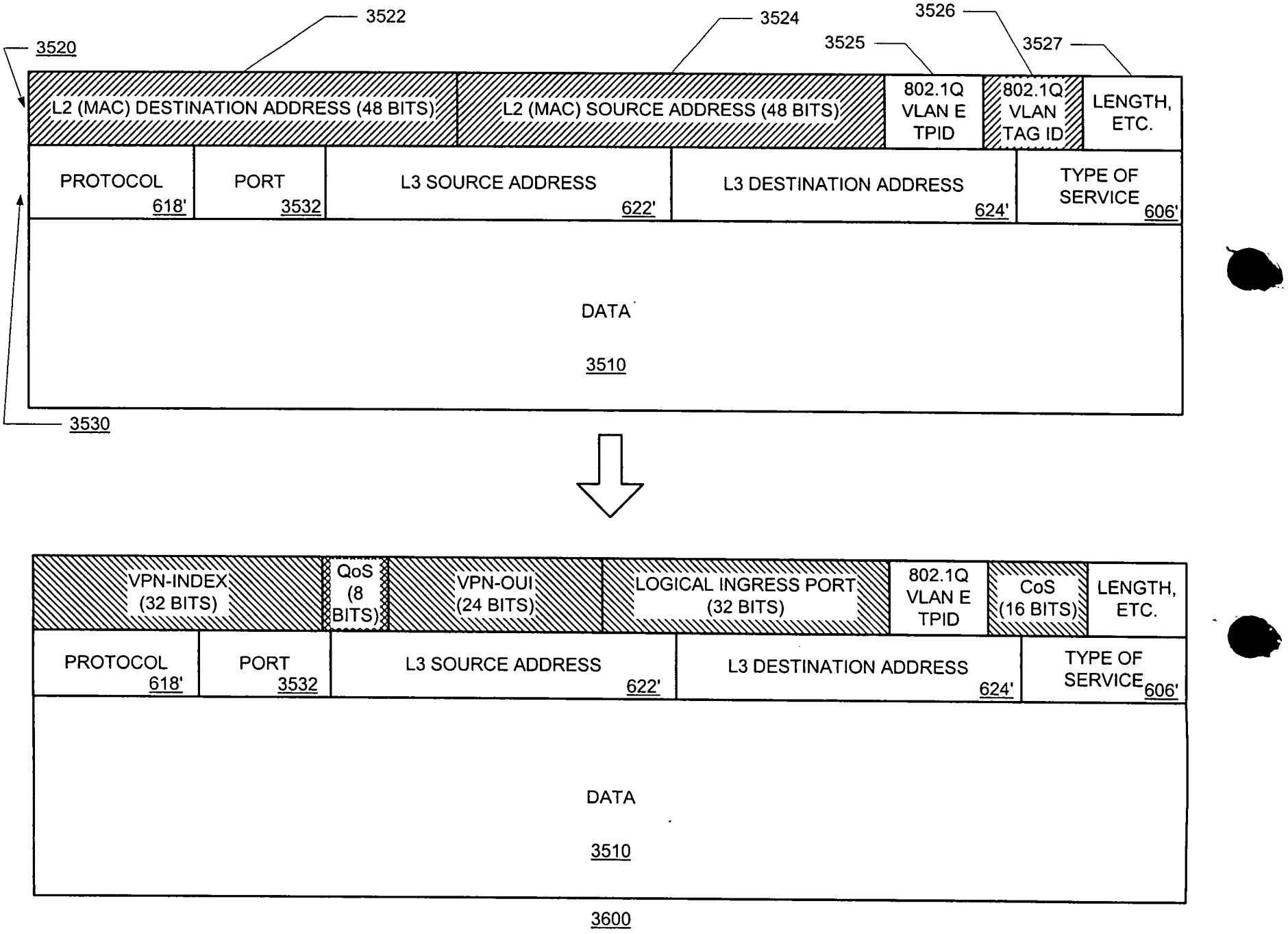
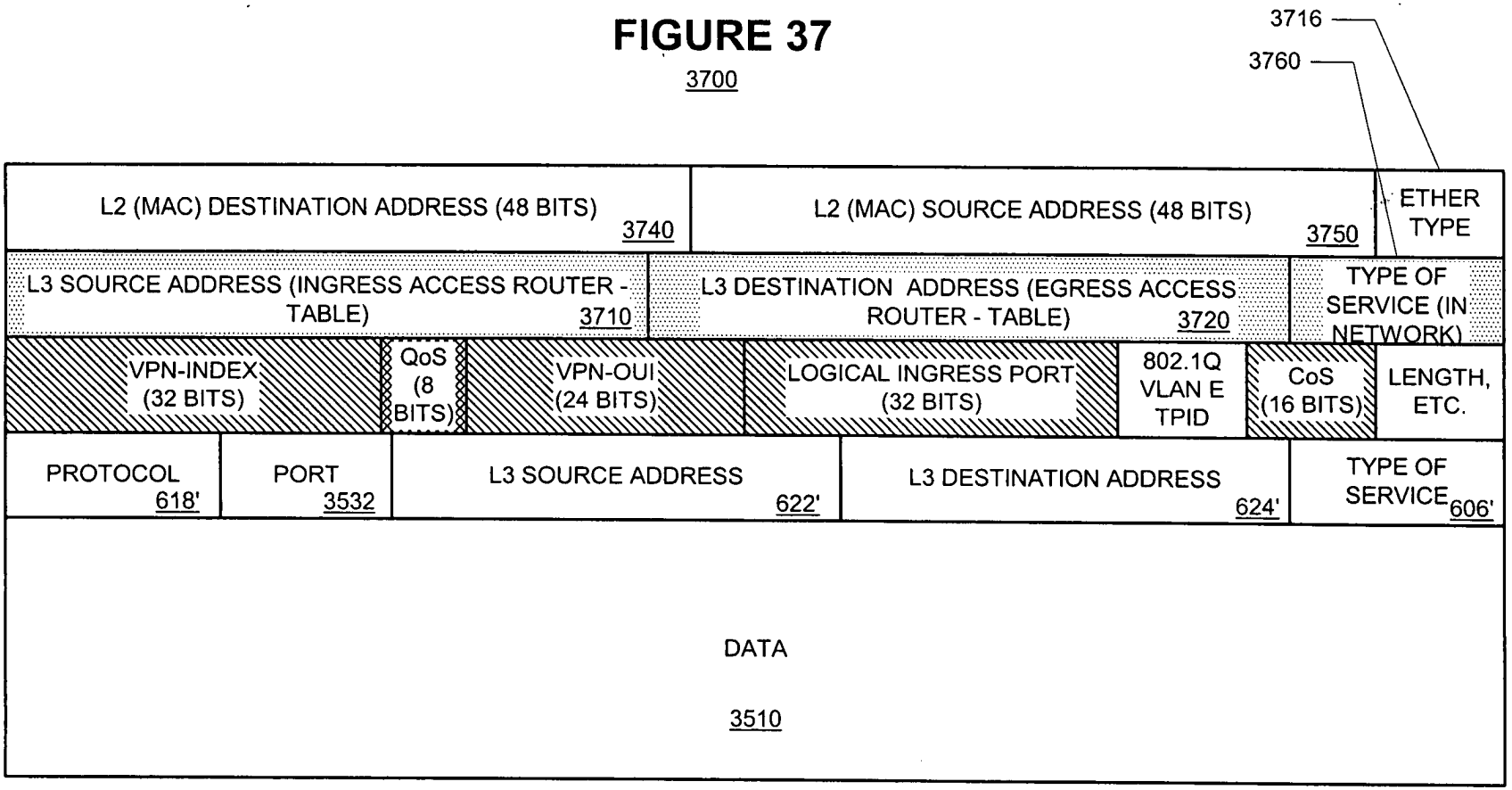

3520
3522
3524
3525
3526
3527
L2 (MAC) DESTINATION ADDRESS (48 BITS)
L2 (MAC) SOURCE ADDRESS (48 BITS)
802.1Q VLAN E TPID
802.1Q VLAN TAG ID
LENGTH, ETC.
PROTOCOL 618'
PORT 3532
L3 SOURCE ADDRESS 622'
L3 DESTINATION ADDRESS 624'
TYPE OF SERVICE 606'
DATA
3510
3530
VPN-INDEX (32 BITS)
QoS (8 BITS)
VPN-OUI (24 BITS)
LOGICAL INGRESS PORT (32 BITS)
802.1Q VLAN E TPID
CoS (16 BITS)
LENGTH, ETC.
PROTOCOL 618'
PORT 3532
L3 SOURCE ADDRESS 622'
L3 DESTINATION ADDRESS 624'
TYPE OF SERVICE 606'
DATA
3510
3600

FIGURE 37

3700